APRIL 10, 1937

ELECTRICAL WORLD

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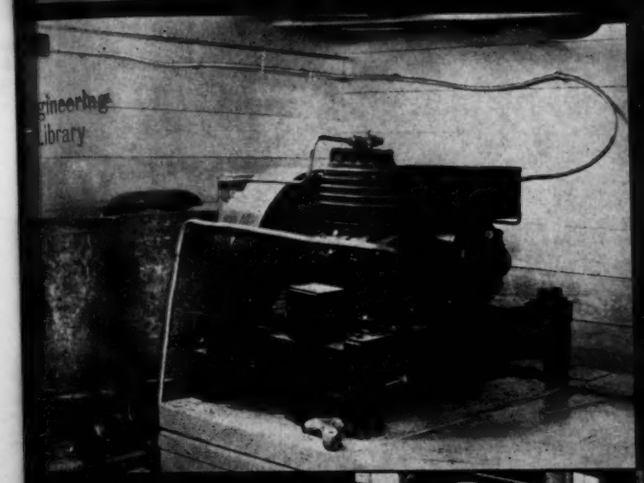

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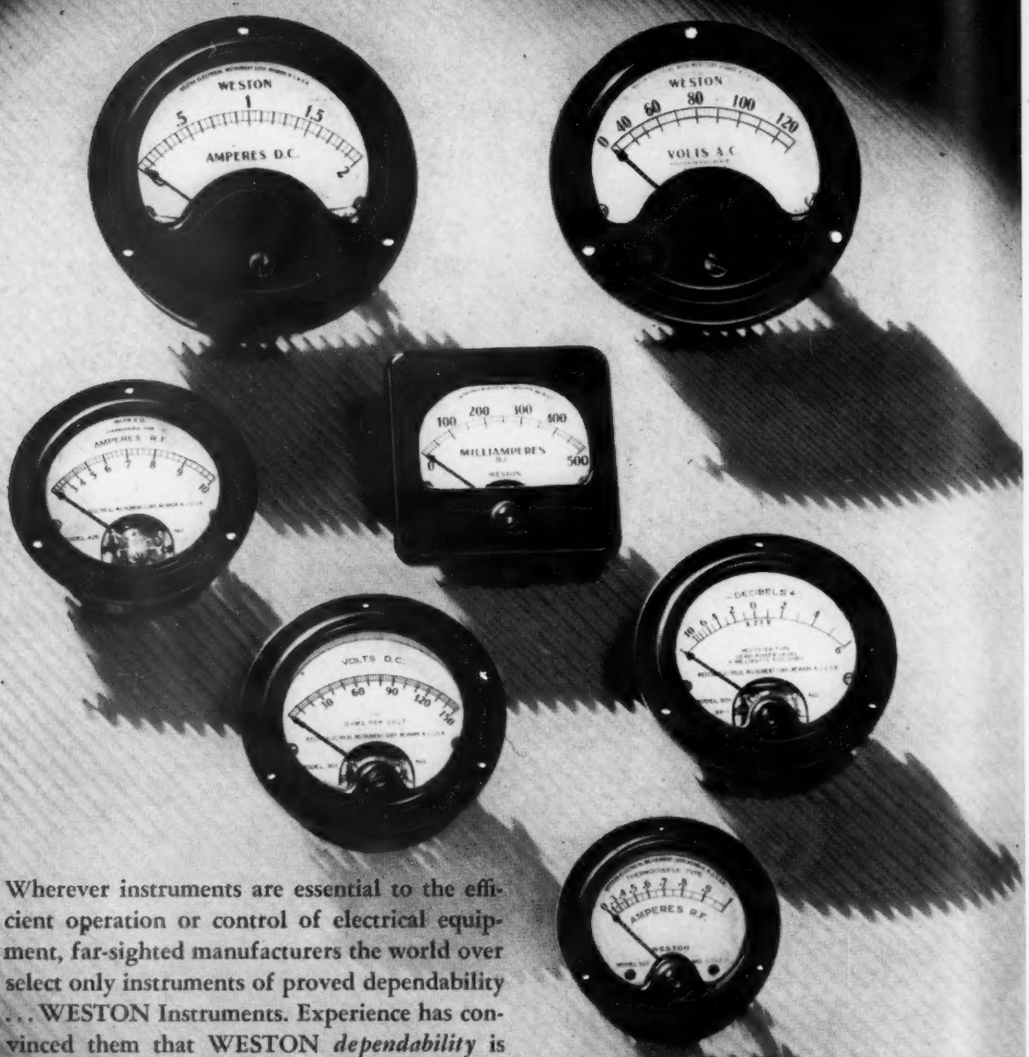

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Coming Features

Supplement on Utility Operations

ELECTRICAL WORLD is collecting data on the operations of power systems in the 100,000,000-kw.-hr. class. The results will appear in the Annual Supplement of May 8. Comparison of sales in 1936 and 1935 reveals some remarkable changes. Industrial loads have been increased by leaps; rural consumption expanded sharply; peaks are higher.

Construction Data on REA Lines

Line characteristics and drawings illustrating the engineering practices on REA-financed lines will be presented in the April 24 issue of ELECTRICAL WORLD. This presentation of data on the construction details of REA lines will cover very closely the same information for REA lines as was presented in ELECTRICAL WORLD of February 29, 1936, for 194 power company lines.

A Meterman Treats Instrument Transformers

It is easy to overlook the limitations of some of the procedures for testing instrument transformers. ELECTRICAL WORLD will soon present some words of reminder on important aspects of the technique.

Generation Rehabilitation

Details of how a nineteen-year-old machine was put back in operation in nineteen days with its original stator rebuilt in the field will be in an article soon to appear.

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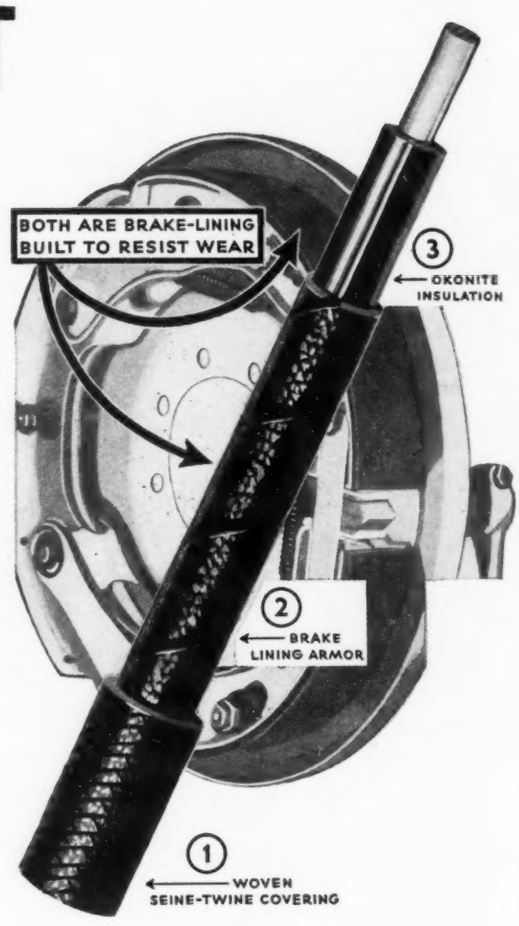

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Letters TO THE EDITOR

Not the First Under-Water Power Station

To the Editor of ELECTRICAL WORLD:

We note with interest the picture on page 90 (766) of the February 27 issue of ELECTRICAL WORLD, referring to the under-water power station. You state that this is *perhaps* the world's first under-water power station.

Just as a matter of historical interest I believe that a good many years ago a similar power station was installed on the Patapsco River, which is appoximately half way between Baltimore and Washington. I do not know whether the station is still in existence as I believe that it was quite unsuccessful, probably not due to the fact that the power plant was within the dam, but to the irregular water conditions that prevailed in the river.

It is possible that this station may not have been completely under water, but my recollection is that it was within the dam.

H. P. HARRIS,
Bryant Electric Company.

[A postmortem search revealed that not only did such an under-water power plant as Mr. Harris describes exist near Ilchester, Md., but that it was fully described in ELECTRICAL WORLD, Volume L, No. 5, August 3, 1907, page 207. Completed in 1906 or 1907 by the Patapsco Electric & Manufacturing Company, Ellicott City, Md., this plant was acquired by the Consolidated Electric Light & Power Company of Baltimore in 1913. It was used as a peak-load plant until March 1, 1932, when, with the advent of other water-power capacity and the decrease in load brought about by the depression, it was closed down.—EDITORS.]

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Lighting Load Still Leads

To the Editor of ELECTRICAL WORLD:

On page 76 of the December 19 issue of ELECTRICAL WORLD, under the heading "Building up the Load," you show some figures on the use of electricity per average customer for the period 1927-35, and refer to this information as having come from the Edison Electric Institute Statistical Bulletin. This tabulation would lead one to believe that only refrigerators and radios are significant factors in the increasing business of the utility company and does not take into account the importance of lighting in the increase in use of kilowatt-hours per residential customer.

R. D. OBERMEYER,
Kansas City, Mo.

[While emphasis is laid on the increasing magnitude of the appliance load, the table of energy used shows that lighting (with a small amount of energy used by minor appliances that cannot well be separately allocated) remains the largest single item, constituting 36.5 per cent of total domestic consumption in 1935. Division of the lower zone of the chart into two sections—"Other Major Appliances" and "Lighting and Minor Uses"—would have traced this dominant position through earlier years. Further, in view of the basic nature of lighting, the revenue for this service is relatively larger than the kilowatt-hour ratio would indicate. For 1934 it was estimated at 44 per cent.—EDITORS.]

•

Give the Local Newspaper a Chance to Be Useful

To the Editor of ELECTRICAL WORLD:

Most utility executives would readily admit that their companies could do more in the matter of creating better customer good will. Also, they would offer many reasons for not doing more. Among these reasons would probably be a feeling that general conditions are still too unstable to warrant the expenditure of more money on public relations work, timidity fostered by fear of criticism from political leaders, such as the charges made some years ago about the utilities using the schools to spread private ownership propaganda, improperly staffed public relations departments and lack of a well-defined plan of public relations activity.

But the real reason would be that the average utility executive has absolutely no sense of drama and he refuses to allow to those who do have it the freedom of expression necessary to make impressions on the public mind.

People in general like human interest stories. They like drama—drama of the actual happening seen or experienced directly; or, failing that, interviews on the radio or in the press with people who have taken part in some dramatic incident.

There are many opportunities in the daily affairs of an electric utility to capitalize on this well-known human trait. It is not necessary that any and all dramatic incidents should be given to the public, because it is very easy to leave a wrong impression which is injurious to the utility, but in the effort to be careful the possibility of doing a great deal of good is too often overlooked. And it is certainly true that the possibility of harm in some things becoming known to the public has been magnified out of all proportion. This risk is much less than the usual utility executive believes.

The danger of information about some incident becoming public property, especially as to the cause, the hazard and corrective measures taken to prevent a recurrence, is largely imaginary. In fact, if handled properly, such publicity could easily be a valuable means to a healthy appreciation of our problems. It would show our efforts to safeguard the customers in the use of a service which has grown from a luxury for a few to a vital necessity for the many.

The dramatization of our business through the medium of local news columns is a phase of public relations which has not been developed to its fullest possibilities in the place where it could be most effective, that is, in small cities and towns.

The local manager, if given some well-defined principles to follow, could often assist the advertising manager of the utility in getting dramatic information to the local editor quickly enough for him to derive the most news value out of it. Editors are human and take pride in doing a good news job. They would be able to humanize and dramatize our story much better than we could do it, if given the necessary information in the right way. A good job on their part depends upon a good understanding of the elements involved. And this should be given to them freely and candidly by the local managers. UTILITY OBSERVER.

[This came to us from a responsible utility employer and only the very reticence he raises justifies us in withholding his name in his behalf.—EDITORS.]

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Should Be 3, Not 8

To the Editor of ELECTRICAL WORLD:

I respectfully direct your attention to page 85 of the ELECTRICAL WORLD—Annual Statistical and Review Number, dated January 2, 1937. The table showing "Central Station Capital Expenditures for New Construction by Classes," line 16, reads as follows:
1936 Steam 53,235, Hydro 5,096, Transmission 56,334, Distribution 19,340, Misc. 22,082.

The total reads $380,087,000. It should be $330,087,000.

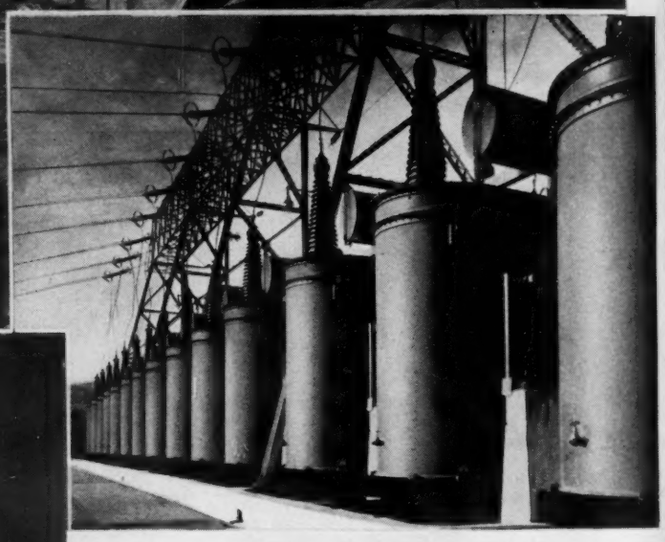
This table is being used for reference purposes and I thought you would like to be informed of this error.

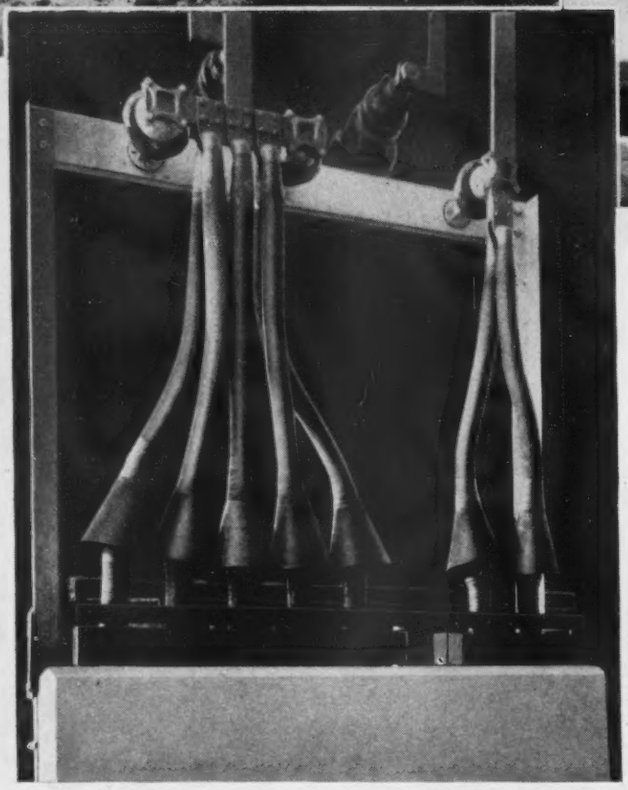
Your Annual Number is a fine publication and of great assistance in my statistical work.

ARTHUR E. DALEY,
Senior Statistician Federal Emergency Administration of Public Works

---

[We appreciate the kind words about the issue, and regret the misprint. We take pains to be accurate, but toward the end of a nineteen-hour day 3 and 8 look almost alike on a proof-sheet. The figure appears correctly in several places on the preceding page, but this error was not detected.—THE EDITORS.]





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CABLES
INSTALLED 1930

DAYS KERITE

THE KERITE INSULATED WIRE & CABLE COMPANY INC
NEW YORK CHICAGO SAN FRANCISCO

ELECTRICAL WORLD

APRIL 10, 1937

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Shadow Fear

Children, and even some grown-ups, alone at night, will see some strange and fantastic shadows made as moonlight steals in the windows. These shadows, springing from an unrecognized source, give rise to weird imaginings and fears. This is shadow fear—the fear of possibility. If unchecked, it breeds the jitters and indecision.

The troubles that have been facing the utility industry have not all been shadow problems. Many of them, such as taxes and federal regulation, have been very real. But, nevertheless, there has been much timidity arising from shadow fear. Of course, at the time a shadow fear is as real as a fear from some known cause—perhaps more real because its source is unknown.

One of these shadows that have been causing much of the timidity of the industry was dispelled last week at the Edison Electric Institute sales conference by President Kellogg. He showed that while 70.3 per cent of the votes cast in municipal versus private plant elections in 1933 were for municipal ownership, in 1936 only 38.6 per cent of such votes favored municipal ownership. Furthermore, the net increase in municipal plants established from 1933 to 1936 inclusive was only 30. In these same years there was established the smallest number of such plants of any previous four-year period since 1886. This record for private ownership occurred in the face of a federal subsidy of some 45 per cent for cities wanting to set up municipal operation.

Secretary Ickes has repeatedly tried to force the people of San Francisco to undertake municipal distribution of Hetch Hetchy power. The voters of that city have every time refused to commit themselves to the financial burden of municipal ownership.

A survey recently made by *Industrial News Review*, and published in our March 27 issue, among more than 1,200 county newspapers showed 977 do not favor municipal ownership, against 307 which do, or 73 per cent opposed as contrasted with 27 per cent in favor.

Surely such heartening data are sufficient to dispel the fear of the municipal ownership shadow. It is the most striking evidence that though you lead a horse to water you cannot make him drink.

This is the time for courage and strength of purpose. There will be continuing pressure for municipal ownership, and perhaps in some instances it will be successful. But for the most part the municipal ownership bugaboo is shadow fear.

Customers want more service. They look to the private utilities for that service today, and will continue to do so tomorrow. Let us leave this one shadow fear to the imaginings of the nursery and go forward to build up sales and extend plants to meet the needs of tomorrow. Shadows cannot be fought; they can only be dispelled through the strong light of facts.

The timidity engendered by shadow fears may in itself bring about the very action that is feared.

With the upward swing in business, there is everything to be gained by a show of strength. There is little to be gained by timidity — or shadow fear.

NEW METHODS SERVE AN OLD ART

The age-old art of the silversmith is coupled with modern manufacturing methods at the Taunton, Mass., plant of Reed & Barton, silversmiths for 112 years. Mercury-vapor lighting, gas-curtained electric furnaces, electric trucks, a well-appointed electroplating department and 876 hp. in motors help to meet the exacting demands of heavy production of an artistic product made from a precious metal. Some 80,000 kw.-hr. per month are supplied to this plant by the municipal lighting department. Modern lighting plays its part in achieving an artistic display of sterling ware at this factory. Here 220 50-watt lamps in a cove arrangement provide 40 ft.-candles in a room 60 ft. long, 17 ft. wide and 10 ft. high.

Experience With Compensated Sheath Cable

Compression Belt of Rubber Over Lead Cable Sheath Corrects for Volumetric Changes in Insulation at Point of Change—Permits Higher Pressures in Solid Cables—Avoids Ionization of Insulation During Cooling Cycles

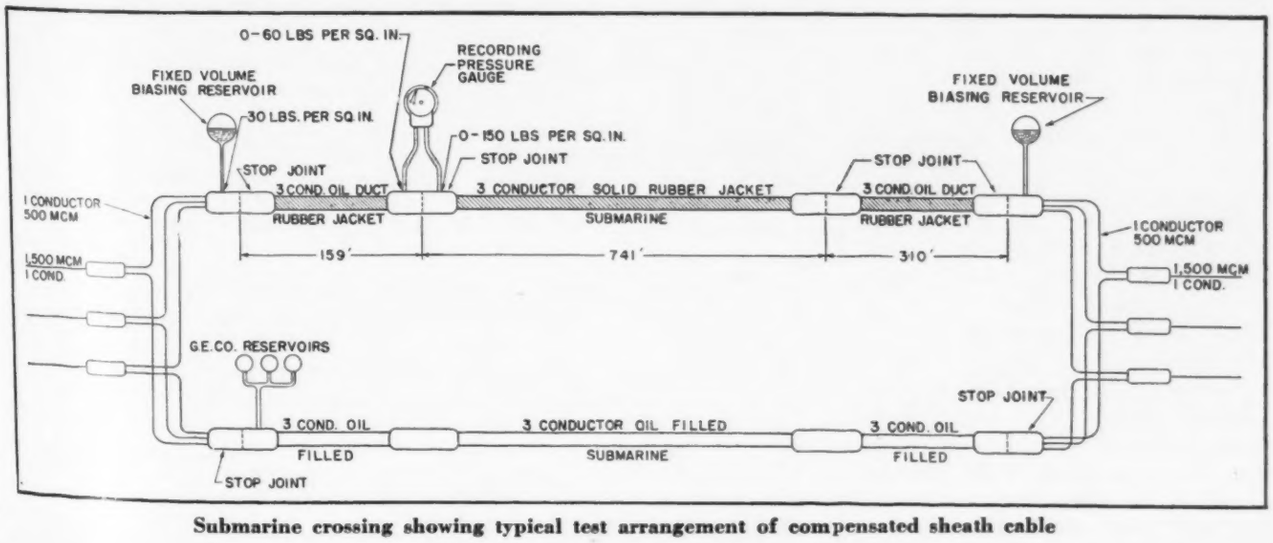
By E. R. THOMAS
Consolidated Edison Company of New York, Inc.

LOW PRESSURES, especially those below atmospheric, reached in ordinary solid type cables during cooling cycles are conducive to ionization and electron bombardment of the oil and paper insulation. Cable constructions, therefore, which take care of physical changes within the cable without permitting low internal pressures to form will permit greater operating temperature ranges and, in general, increase carrying capacities. A new compensated sheath cable now under service test on the system of the Consolidated Edison Company of New York has sought to avoid low internal pressures by increasing the normal pressure of the cable from one to about four atmospheres so that on cooling the cable pressure would still be above atmospheric.

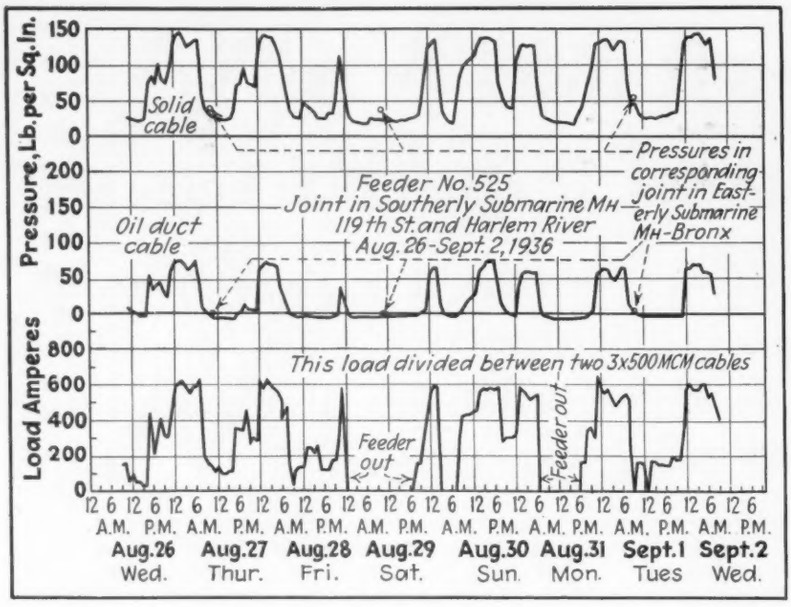
Two types of compensated sheath cable are being tested. The armored cable construction is made up of three 500,000-circ.mil compact stranded conductors insulated with 297 mils of paper, shielded, and sheathed with 125 mils of lead. Over the lead vulcanized rubber tapes were wrapped under tension, providing a compression belt of rubber approximately 100 mils thick, which exerted a hoop stress on the lead sheath of about 1,000 lb. per square inch, the resulting static fluid pressure inside the lead sheath being about 70 lb. per square inch gage pressure. Protective coverings of rubber-filled duck tape, soft bed of jute and galvanized iron armor wires completed the construction.

A second type of compensated sheath cable consisted of three 500,000-circ.mil stranded conductors insulated with 180 mils of paper, shielded and laid up with three longitudinal oil ducts similar to the usual oil-filled cable construction. A lead sheath of 125 mils was used. A compression belt of vulcanized rubber tapes was wrapped in tension over the lead sheath similar to the submarine cable. This rubber compression jacket was given a protective covering of rubber-filled duck tape and braid.

These two types of compensated sheath cable were designed to operate on the principle of taking care of the volumetric changes in insulation at the point of change rather than summing up the unit volume changes as is done in the oil-filled cable design. Tests indicated that a rubber jacket exerting hoop stresses on lead cable sheath would provide a compensation force to cause the internal diameter



Submarine crossing showing typical test arrangement of compensated sheath cable


Pressure, Lb. per Sq. In.
Solid cable
Oil duct cable
Feeder No. 525
Joint in Southerly Submarine MH
119th St. and Harlem River
Aug. 26-Sept. 2, 1936
Pressures in corresponding joint in Easterly Submarine MH-Bronx
Load Amperes
This load divided between two 3x500 MCM cables
Feeder out
Feeder out
12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6
A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M. A.M. P.M.
Aug.26 Aug.27 Aug.28 Aug.29 Aug.30 Aug.31 Sept.1 Sept.2
Wed. Thur. Fri. Sat. Sun. Mon. Tues Wed.

Pressure-time curves for solid and oil-duct cables follow changes in loading closely without appreciable lag

of the sheath to reduce as the included volume was reduced. Test lengths were given a standard bending test. Wrinkling of the lead sheath was less pronounced than with standard construction.

Cable crosses river

Four submarine crossings were installed in the fall of 1935 on two tie feeders between Hell Gate generating station and Waterside station. The submarine crossing for each feeder is made by operating two three-conductor 500,000-circ.mil, 27-kv. cables in multiple to provide sufficient current-carrying capacity. Each of these crossings consists of an oil-filled type cable operating in parallel with a new type cable having a compensated sheath to take care of volumetric changes in compound. A typical installation is shown in an accompanying illustration.

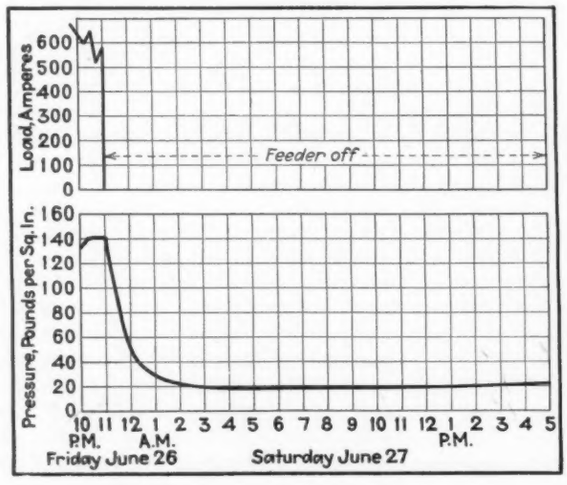
Land-end sections, which were made up with cable containing oil ducts, were isolated from the solid type cable and the rubber-jacketed submarine cable with stop joints. Dual-recording pressure gages were installed on the stop joints between the two types of compensated sheath cable to obtain operating records. The casings of all joints connected to the rubber-jacketed cables were reinforced with metal banding to withstand operating pressures of more than 150 lb. per square inch. In order to reduce the differential pressure on the stop joint diaphragms between the oil duct rubber-jacketed cable and the ordinary solid cable fixed volume reservoirs were connected on the solid cable side. These reservoirs were put under a pressure of 30 lb. per square inch and thus provided a bias pressure, reducing the differential pressure which the stop joint diaphragms were required to withstand.

The installation and splicing of the submarine section did not differ from usual practice with solid type cable. The cable was impregnated with heavy cable compound and did not bleed very much during the time the ends were open. A temporary test cap which was wiped on one end of a length and not reinforced was found split open about twelve hours later. The rubber jacket on the oil duct cable used on the land ends quite soon ejected the surplus oil when the ends were opened until the sheath came to rest tightly against the internal cable structure. The joints on the oil duct cable were evacuated, filled with oil and the cable then pumped up to an oil pressure of between 30 and 40 lb. per square inch.

Bias pressure raised

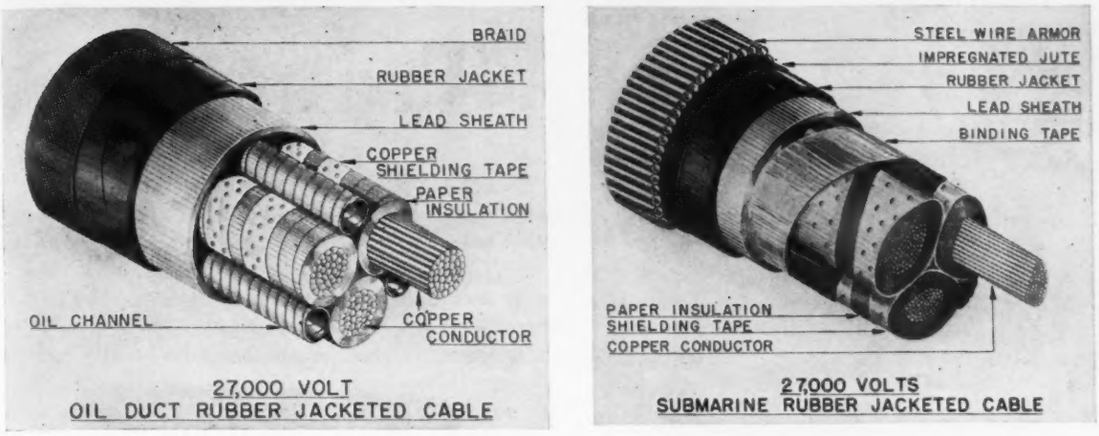
A typical pressure-time curve replotted from one of the recording gages installed in the field is shown. It is interesting to note the rate of change and the magnitudes of the pressure developed due to load cycles. The normal static bias pressure in the rubber-jacketed solid submarine cable is about 60 lb. per square inch and its operating range is between 10 and 150 lb. per square inch. The rubber-jacketed oil duct cable has been operated at a lower static bias pressure, about 30 lb. per square inch. This has resulted in pressures below atmospheric for some of the changes in loading. The bias pressure on this cable is gradually being raised by pumping in additional oil from time to time. Static bias pressures below 55 lb. per square inch indicate that the sheath is being supported by parts of the cable assembly rather than the fluid pressure of the impregnating compound.

Last June one of the feeders tripped out after it had been carrying an average load of 600 amp. during the preceding two hours. A plot of the decay in pressure during the time the feeder was off is shown in an accompanying illustration. The pressure dropped from 140 lb. per square inch to a minimum of 19 lb. per square inch and then gradually built up again. This build-up would have continued on to the normal static bias pressure of 55 lb. per square inch if



Decay of pressure in solid cable side of stop joint during period when cable was carrying no load

Note that the cable pressure dropped from 140 lb. per square inch to below normal static bias pressure (55 lb. per square inch) within an hour after the feeder was tripped off.



Oil duct and submarine rubber-jacketed cable, showing arrangement of jacket over lead sheath

the feeder had remained off long enough.

Thus during an increase in temperature of the cable, pressure will be developed above the normal bias pressure and during cooling pressures will fall below the normal bias pressure. This is the same action which occurs in ordinary solid type cable, except in that cable the normal bias pressure is atmospheric pressure and during cooling cycles pressures below atmospheric are encountered. These low pressures are conducive to cause ionization and electron bombardment of the oil and paper insulation.

The operating experience for the ten months of service which might be summarized is as follows:

1. Heavy cable oil as used in ordinary solid cable is preferable to light cable oils which bleed freely during installations.

2. Paper insulation thicknesses used in oil-filled cable construction appear satisfactory for this type of cable if operated at pressures above atmospheric.

3. Life of the lead sheath is not definitely known, but it is believed to be unaffected by the compensating action.

4. Life of the type of rubber used for a jacket in this cable is not known, but it is believed to be capable of acting as a compensating member for between fifteen and twenty years.

5. Cost of the cable installed is but slightly more than solid type cable and cheaper than oil-filled cable.

6. Oil reservoirs and fitting assemblies are eliminated from manholes.

Unfair Competition Is Justice Perverted

A Justice of the Peace down in Texas beyond the Pecos was Mayor, Chief of the Fire Department, City Treasurer, Tax Collector, head of the Chamber of Commerce, head of the Police Department and Coroner.

One day he was called upon to sit on the body of a man who had come to a sudden and violent death. He searched the body and found a $20 bill in one pocket and a pistol in the other. He confiscated the pistol and fined him $20 for carrying concealed weapons.

So when the government or municipality goes into the utility or railroad business, like the Justice of the Peace beyond the Pecos, it enters into competition on unfair terms. It pays no taxes and takes your money in the way of taxes and uses it to build an enterprise in competition with your own and makes you furnish the money for your own destruction.

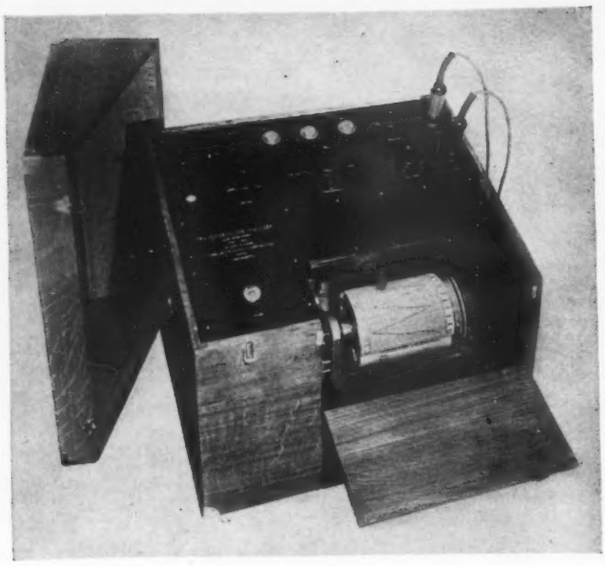
That is worse than fining the corpse for carrying concealed weapons.—Former Gov. E. C. STOKES of New Jersey to National Association of Railroad and Utilities Commissioners.

Why Purchased Power Must Be Advertised

Try to imagine the situation if the power industry overnight lost the total industrial load. Costly turbines would stand idle; those that continued to operate would do so at much reduced efficiency. Transmission and distribution systems would carry but a fraction of their capacity. Expenses would keep on about as high as, or conceivably higher than, before the industrial business was cut off, meaning that the cost of the delivered kilowatt-hours would soar beyond reason. In a short time sharp rate increases to domestic and commercial customers would have to be made.

In all probability no rates high enough to avoid bankruptcy could be charged, simply because the public could not afford to pay them. These same technical-economic laws apply to all electric power enterprises — commercial, government, state and municipal. Once you have a huge plant capable of delivering cheap electricity, you must have correlating load and load factor to avoid huge losses. —W. H. HODGE, Vice-President Byllesby Engineering & Management Corporation, to Petroleum Electric Power Club.

Transmission



DURING the past few years an important development in transmission line testing has taken place with the objective of shortening the time required to locate major faults such as open circuits, short circuits and heavy grounds, thus avoiding delays due to patrolling under conditions unfavorable to rapid coverage of routes. The work has been accomplished by engineers of the Pennsylvania Water & Power Company. The apparatus and its regular application to the Pennsylvania system were described by J. E. Allen and G. J. Gross of that utility (who designed the method used) in a paper which won the first James H. McGraw Award for 1935 and published in the August, 1935, Edison Electric Institute *Bulletin*.

The equipment has lately been developed to commercial availability by the Tobe Deutschmann Corporation of Canton, Mass., and was recently demonstrated before a large group of utility engineers at Boston, where a special test was run at the Baker Street substation of the Boston Edison Company on a 66-kv. tie line with connection to the New England Power Company's system. The analyzer, or Telemetrograph as it is called, detected the location of a phase-to-phase "short" within about 0.2 of 1 per cent, or about 105 ft., and revealed the location of a "short" between two phases at the end of the line within 0.01 mile.

The Allen-Gross method is based on impressing a continuously variable frequency upon one phase of a transmission line, recording the current waves graphically and determining from the relationship between distance and frequency the location of the open

Field Test No. 1

Object—To show the routine procedure followed in determining the location of a fault whose origin is unknown.

Nature of Fault—A phase-to-phase short applied 30,006 ft. (5.68 miles) from the Baker Street substation.

Procedure—1. Clear all three phases at Framingham.

2. Connect the ground terminal of the "Telemetrograph" to the station ground at Baker Street.

3. Connect the output terminal of the Telemetrograph to one phase at Baker St.

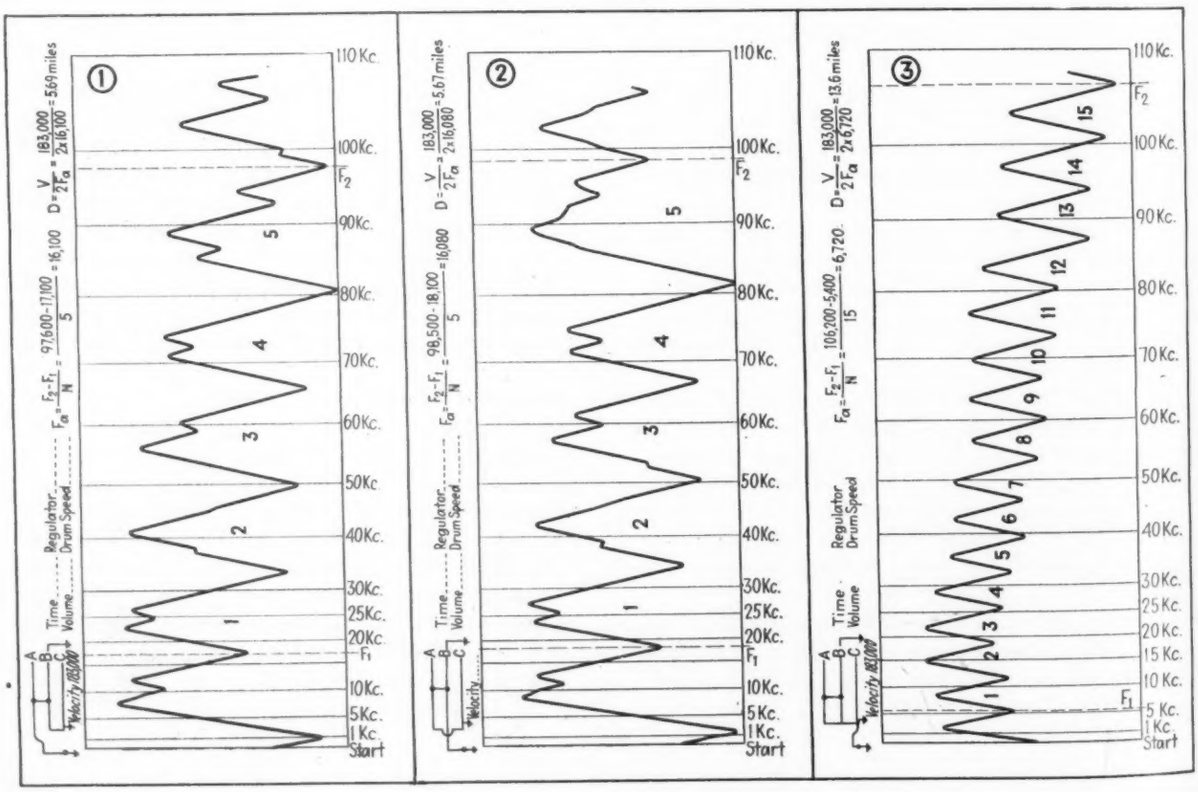
4. Connect the two remaining phases to the station ground at Baker Street.

5. Run one chart for this test condition.

6. Repeat this procedure for each of the two remaining phases.

Analysis of Charts—From data secured in preliminary tests conducted on a portion of this line on January 17, the velocity of propagation has been calculated as 183,000 miles per second. This value was, therefore, used in determining the distance to the fault in this test.

To secure maximum accuracy, the value



Faults Located Accurately

Telemetrograph Uses Variable High-Frequency Impulse Beats to Disclose Location of Shorts and Grounds on Overhead Line

wire, short or ground. The underlying theory involves the principle of reflection and phase shift which a current impulse undergoes when impressed on a transmission line having distributed capacity and inductance. Such an impulse travels along the line at a velocity nearly equal to that of light and undergoes an attenuation in magnitude as well as a phase shift with respect to the sending end. As the impulse encounters an irregularity, such as the far end of the line or a short circuit, it is reflected backward toward the sending end at the same velocity and with additional phase shift.

The following simple equation expresses the relation between the distance to the fault, the velocity of wave propagation and the average frequency difference between peaks on the graphic record:

$$D = \frac{V}{2F_a}$$

in which D is the distance in miles, V the velocity of propagation in miles per second, and F_a the average frequency difference between the peaks on the graph.

The value of F_a is found through the equation

$$F_a = \frac{F_2 - F_1}{N}$$

in which F_1 is the lowest frequency that can be accurately read on the

[*Continued on page* 50]

of F_a should be determined for the greatest range of frequencies that may be accurately read. In chart No. 1, the nodal points appear to be more susceptible of accurate determination than do the peaks, and for this reason they were used to secure the values of F_1 and F_2. The data for calculating the distance to the fault are, therefore:

F_1 equals 17,100 cycles
F_2 equals 97,600 cycles
N equals 5
F_a equals 16,100 cycles
D equals 5.69 miles.

The fact that the graph starts near the bottom of the chart indicates that the trouble on this phase is a ground or a short rather than an open circuit.

Chart No. 2—In this chart, as in the one for the first phase tested, the nodes give a more accurate indication than do the peaks and they are, therefore, used for determining the values of F_1 and F_2. The data for calculating the distance to the fault on this phase are:

F_1 equals 18,100 cycles
F_2 equals 89,500 cycles
N equals 5
F_a equals 60,080
D equals 5.67 miles.

On this chart, as on the preceding one, the graph starts at the bottom of the chart, thus indicating that the fault is a short or a ground rather than an open circuit. From the fact that the two phases already tested show the same characteristics, it is evident at once that they are shorted at a point about 5.7 miles from Baker Street. Although the first two charts appear to indicate that the fault has been located, it is not satisfactory to assume that the third phase is clear. Routine procedure, therefore, requires that the third phase be charted.

Chart No. 3—On this chart the nodal points appear to provide the best indication of accurate frequency reading and are, therefore, used in securing the data for the line, which are as follows:

F_2 equals 5,400 cycles
F_1 equals 106,200 cycles
N equals 15
F_a equals 6,720 cycles
D equals 13.6 miles.

Since these figures correspond to the full length of the line, they indicate that the third phase is clear.

The total elapsed time required for securing the three charts and making the necessary calculations was fifteen minutes. In actual practice the only calculations required would be those for determining the value of F_a. After this value has been determined reference to a chart in which pole numbers are plotted against frequency difference will indicate the location of the fault in terms most familiar to troublemen.

Conclusions—In this test the actual distance to the fault was 5.68 miles and the graphs secured for the faulted phases indicated distances of 5.67 and 5.69 miles. This accuracy of about 2/10 of 1 per cent is considerably greater than is claimed for the equipment, but is an indication of the basic correctness of the principle on which the Telemetrograph operates.

Field Test No. 2

Object—To secure a chart showing the characteristics of the full length of line and to calculate from this chart the velocity of propagation for the line.

Procedure—1. Clear all three phases at Framingham.

2. Ground two phases at Baker Street.

3. Connect ground terminal of Telemetrograph to station ground at Baker Street.

4. Connect output terminal of Telemetrograph to ungrounded phase at Baker Street.

5. Run a chart for this test set-up.

Analysis of Chart: No. 4—In this chart the impedance peaks which are normally used appear to give most accurate indication of frequency limits and are, therefore, used in securing data for calculation of V. The data secured from this graph are:

F_1 equals 7,700 cycles
F_2 equals 102,700 cycles
N equals 14
F_a equals 6,770 cycles
D equals 13.5 miles (previously determined)

Calculations—

$$V = 2D \frac{(F_2 - F_1)}{N}$$

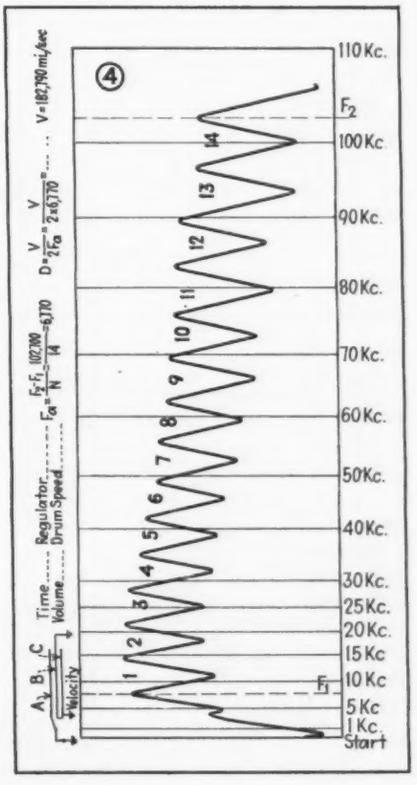
$$= 2 \times 13.5 \times \frac{102{,}700 - 7{,}700}{14}$$

$$= 2 \times 13.5 \times 6{,}770$$

$$= 182{,}790$$

So far as ordinary slide rule calculations may be read the velocity for this line is, therefore, 183,000 miles per second.

Conclusions—The fact that the velocity of propagation for the full length of line as calculated from the data secured by this test equals the velocity which gave accurate indication of fault location in test No. 1



proves the accuracy of the method whereby velocity is determined.

Instrument Transformer Practice

Modernized Practice Is Based on Standardization, Classifications, New Electrical Materials and Forms of Equipment Protection

OUTDOOR types of instrument transformers require a weatherproof case and outdoor bushings, which necessitate slightly larger dimensions and higher cost for the same rating, as compared with indoor equipment.* It has now become the practice to furnish only outdoor types for 22 kv. and over, even for indoor service. While the great majority of instrument transformers are built in single units, combination units have a real advantage in the higher voltages. Above 13 kv., when bushings become large and costly, one tank can house from two to four elements and with fewer external connections. An outdoor metering outfit is compact, has simple connections and for 22 kv. and above costs less than separate units. Thus, a 22-kv. installation for three-phase metering, with separate units, requires four tanks and six bushings, against one tank and three bushings for the combined unit.

Dry type insulation between coil and housing has been widely used for indoor service up to and including 13 kv. and compound types for outdoor units in this range. Oil is generally used above 13 kv. for both indoor and outdoor use. Lately at least two of the large manufacturers are bringing out new designs in which compound is used over a much larger range of potentials, especially for potential transformers in the lower voltage classes. Recently stud type bushings have become popular and will be used more and more in both indoor and outdoor types. These have many advantages in maintenance and installation and fit well in securing higher insulation to meet the new co-ordination levels.

*From a recent paper before the New England electric meter committee.

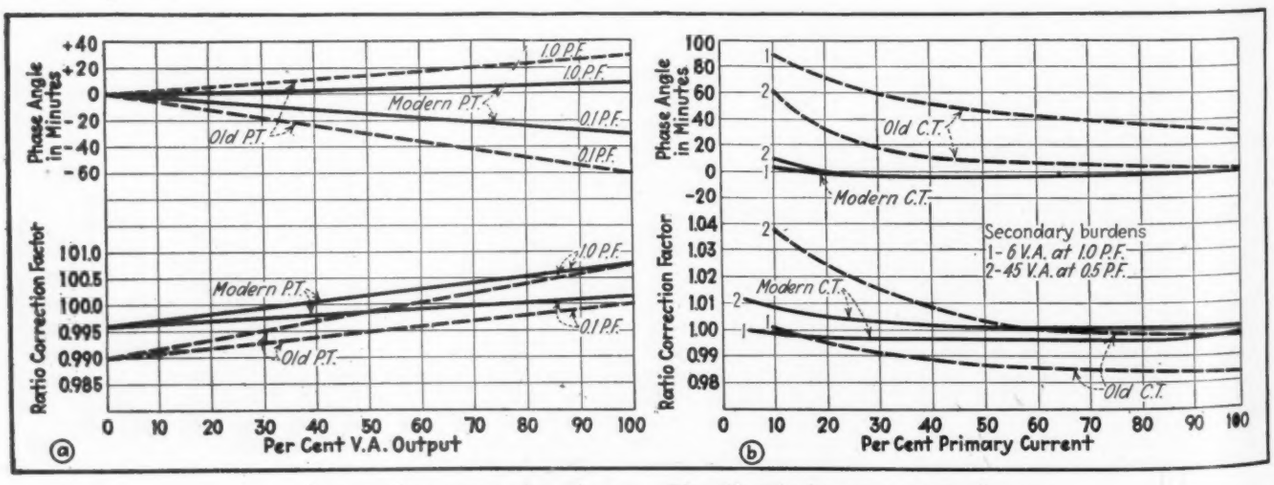
Braced circular windings for strength on faults

Current transformers used in modern large generating stations and on important interconnected systems involving extremely high short-circuit currents must be strong enough mechanically to resist the heavy stresses set up by these short circuits and must have enough copper cross-section to avoid reaching temperatures dangerous to insulation. A high mechanical rating is reached by making the primary winding as nearly circular as possible and by properly bracing windings and frame. Safe mechanical ratings are established for currents for durations of the order of 0.1 second. The mechanical rating of a good current transformer should be from 100 to 250 times rated current, depending on the type and rating. For thermal rating a definite time should be specified, commonly 1 second. A good current transformer should have a thermal rating of 35 to 90 times rated current for 1 second.

To provide a definite standard of values of impulse rating N.E.M.A. and A.S.A. have proposed a set of test values defined in the form of inches of gap of voltage from a surge generator. Transformer insulation levels are given both in inches of gap and in low frequency test.

In applying Table I to instrument transformers it has been agreed that when the exposure to impulse is low the next lower insulation level may be specified. It appears at present that the above rule will be so interpreted by the manufacturers that all outdoor units will be built to the higher level specified and standard indoor units will be built to the next lower level. In line with the new coordination idea, many of the new instrument transformers will be provided with arcing gaps on the bushings to protect the windings and the bushings from surges and to assist in obtaining definite insulation levels.

As an indication of the higher in-



Improved accuracy of modern vs. older 60-cycle instrument transformers
(a) Potential transformers. (b) Current transformers.

By S. B. VAN BUREN
New England Power Company
Worcester, Mass.

Trends

Silsbee test set-up on operating table, switchboard panel at the right of the tester, standard and unit under test on floor in front of panel, and at the rear portable transformer for potential tests. At this office (Harvard Street) tests can be run on current transformers of from 5 to 3,000 amp. rating and on potential transformers ranging from 110 volts to 22 kv. Insulation, ratio and phase angle tests are provided for at this office. Many tests are made without removing the instrument transformers from the crates and much time is saved by testing current transformers on the floor as shown. Plans are under consideration for a greater segregation of high potential tests from other check-ups.

Testing instrument transformers at New England Power's Worcester offices

sulation levels, Table II is given, comparing the old A.I.E.E. tests with the new proposed tests.

Most manufacturers now offer many of their regular lines of current transformers in double ratio as well as in the standard single-ratio types. These consist of two primaries and one secondary. The extra cost of double-ratio instrument transformers makes it impracticable to use them extentensively in the smaller sizes, but in the higher voltage types the double-ratio feature costs little more and its use has become widespread.

The cost of one three-wire current transformer and one two-wire meter is considerably less than that of two regular current transformers and one three-wire meter, and the three-wire transformer is being widely used in metering 115 - 230 - volt, three - wire circuits.

Double secondary current transformers are used in some applications where the burden is too large for one transformer and where space prohibits two sets. These special transformers have one primary and two secondaries. A common practice is to connect one secondary to the relays and the other to the meters. In this way the heavy burden from the relays does not introduce errors into the meter registration. Where space allows, however, two sets of standard current transformers provide a better and more flexible layout.

Accuracy requirements

Two or more accuracy classes are now offered by manufacturers, because when the highest accuracy is not required the transformer can be made smaller and less costly and still render full satisfaction. With some of the modern highly sensitive relay schemes, however, current transformers with fairly high and uniform accuracies are necessary. The ratio accuracy on overcurrent ranges is specially important for good differential protection. A good relay current transformer should have ratio accuracy maintained up to ten or twelve times rated current, and of course good mechanical strength on overloads. On the other hand, a current transformer with a poor ratio curve, such as a bushing type, can be entirely satisfactory for current measurement alone or for relay operation if the ammeter or relay is calibrated for the particular transformer.

Potential transformers for voltage measurement require good ratio accuracy, the phase angle accuracy being less important. The most important consideration in selection is the proper volt-ampere rating. Indicating voltmeters have low burdens, but most curve-drawing voltmeters have rather high burdens. Instrument transformers used for power measurements require not only small ratio errors but small phase angles, if high accuracy of meter registration is to be had. With current transformers the design should hold to very small or no ratio or phase angle errors over the whole working range of primary current. Further, this accuracy should continue over a considerable range of secondary burdens. This means that a high-grade current transformer for power measurements should have very small errors over a load range of from about 1 per cent to 125 per cent of rated current, and should hold this accuracy whether one or five watt-hour meters are used in conjunction with it.

In the case of potential transformers the burden requirements for accuracy are even more severe as there is a

Table I — Impulse Ratings Proposed for Instrument Transformers

Rated Circuit Voltage	Max. Rated Trans. Voltage, Kv.	Impulse Test Gap Spacings, Inches	Low-Frequency Test, Kv.—R.M.S.
120	....	....	..
240	....	....	..
480	....	....	..
600	1.2	0.8	10
2,400	....	....	..
2,500	2.5	1.6	15
4,160	....	....	..
4,330	....	....	..
4,800	5.0	2.2	19
6,900	8.66	3.3	26
11,500	....	....	..
13,800	15.0	4.5	34
23,000	25.0	7.1	51
34,500	34.5	10.2	70

Table II—Comparison of Old and New Insulation Tests—Voltage Transformer

Voltage Class	Old A.I.E.E. Test Kv.	New Proposed Tests	
		Outdoor, Kv.	Indoor, Kv.
600	4.0	10	10
2,300	10.0	19	15
4,600	11.0	26	19
6,900	16.0	34	26
13,800	29.0	34	26

Table III — N.E.M.A. Potential Transformer Accuracy Classes

Class	Ratio Error Limits	Phase angle Error Limits
½	± 0.5 per cent	± 20 ft.
1	± 1.0 per cent	± 40 ft.

N.E.M.A. Potential Transformer Standard Burdens

Burden	Volt-Amperes	Power Factor
W	13	0.10
X	25	0.70
Y	75	0.85
Z	200	0.85

Table IV — N.E.M.A. Current Transformer Accuracy Classes

Class	Per cent of Rated Current	Ratio Error Limits	Phase Angle Error Limits
½	10	± 0.50 per cent	± 20 ft.
	100	± 0.25 per cent	± 10 ft.
½	10	± 1.00 per cent	± 40 ft.
	100	± 0.50 per cent	± 20 ft.
1	10	± 2.00 per cent	± 80 ft.
	100	± 1.00 per cent	± 40 ft.

N.E.M.A. Current Transformer Standard Burdens

Burden	Volt Amperes	Power Factor	Impedance	Resistance
X	2.5	0.90	0.10	0.09
Y	15	0.90	0.60	0.54
Z	50	0.50	2.00	1.00

tendency to connect a large number of potential elements to transformers, and in addition the accuracy should be maintained over a voltage range of 25 per cent above and below normal. Here is a difficult manufacturing task, but curves of late designs show remarkable results in an over-all accuracy. The methods include the use of high permeability steel, such as Hipernik, in place of silicon steel; the Wilson scheme of compensation and the Brooks type of compensation. The first plan has the advantage of being non-aging, with three times the permeability of regular steel and half the losses, with reduced weight, but the susceptibility to mechanical shock is greater and the cost is high. The second plan improves transformer characteristics through the normal operating range and especially at low primary currents, with no detrimental effect on the overcurrent conditions. The drawback is the possibility of mechanical damage to the more or less exposed turns. The third scheme is rather complicated and is being less used because of the greatly improved performance of standard types of transformers. Its chief field is in bar type current transformers of low rating where it is difficult to obtain sufficient accuracy in the standard types.

To secure uniform standards of accuracy N.E.M.A. has adopted classes of accuracy as well as a list of standard burdens. (See Tables III and IV.) These are in use by all manufacturers. In speaking of an accuracy class, the burden should always be specified as well as the class as 1/2 or 1X.

For low-potential industrial installations up to about 2,300 volts the best practice calls for installing all instrument transformers in steel cabinets, all connections being metal-inclosed. A full line of outdoor units is now available in all ratings. It has become good practice to omit fuses from all potential transformers unless these are connected to circuits without other overload protection. A number of special quick-opening interrupting devices has lately been brought out to operate at much smaller current values and also be mechanically strong enough to prevent the fuse element from disintegrating from corrosion or shocks. Resistors are sometimes connected in series with the primary fuses to limit the current when the short-circuit current at the site is too high for the fuse. Secondary fuses are only installed on large capacity potential transformers or on metering outfits which cannot be fused on the primary.

It is recommended that all current transformers rated 23 kv. and over be provided with some form of by-pass protection to protect the windings from surges during line disturbances. The simplest form is a spark gap in parallel with the windings and placed on the bushing terminals. Other forms are the vacuum tube arrester, the "Thyrite" protector and low-voltage autovalve arrester. There is now a demand for a small, compact and inexpensive current transformer for use on low-voltage networks. The meter committee of the A.E.I.C. has drawn specifications for such an outfit and it is hoped that the manufacturers will soon bring one out. The specifications are, briefly: Maximum voltage rating, 1,000; operating voltage, 600 or less; current ratings, 200 to 2,400 amp. inclusive; continuous thermal rating, 150 per cent of rated current; maximum ratio error, 0.5 per cent with burden of 8 v.a. at 80 per cent power factor; maximum phase angle error, 28 minutes; selling price, not over $15.

Transmission Faults Located Accurately

[*Continued from page 47*]

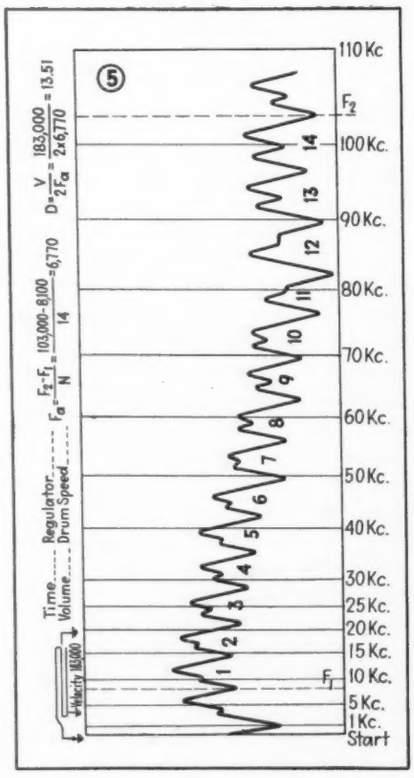
graph, F_2 the highest frequency that can thus be read and N the number of spaces between the two peaks whose values are used.

The practical application of the method requires a continuously variable frequency oscillator, preferably of the beat-frequency type, and a graphic current recorder capable of responding to the complete range of oscillator frequency. The graphic record, obtained on a revolving cylinder, shows the current variations as a function of the frequency, and for a particular line can be quickly translated into tabulated distances or even pole or tower numbers.

In many cases the fault can be located within a single span.

Boston Edison line tested

In the recent demonstration at Boston the line was 13.6 miles long, constructed on wooden poles with steel crossarms, and consisting of three No. 0 copper conductors spaced 90 x 72 x 115 in. It is insulated for 69 kv. with suspension type porcelain insulators and has no transpositions. In using the test apparatus the line was cleared at both ends and the output of the wave generator applied between each phase and the station ground, connection to the line being made at the line side of the oil circuit breaker. The lightning arresters were not disconnected during the test.



Field Test No. 3

Object—To secure a chart showing the effect of shorting two phases at the far end of the transmission line.

Procedure (Chart No. 5)—1. Leave all connections at Baker Street as in tests Nos. 2 and 3.

2. Clear the ground at Framingham from the phase to which the output of the Telemetrograph is connected.

3. Place a direct short between this phase and one other phase at Framingham.

4. Run one chart with this test set-up.

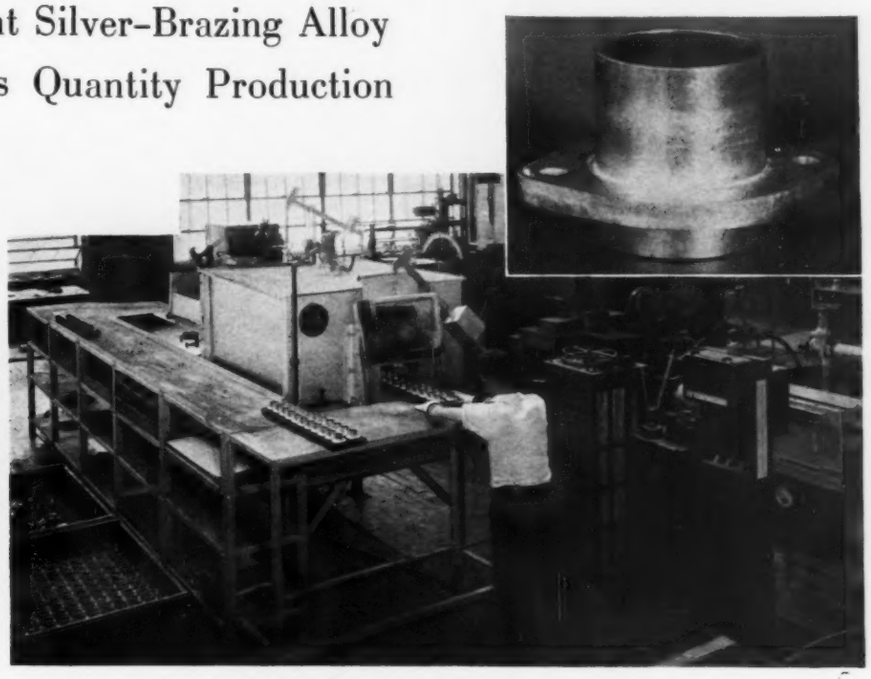
Analysis of Chart—On this graph the nodal points give a more accurate indication of frequency limits and are, therefore, used for determining F_1 and F_2. From the data provided by this graph the value of D is calculated as 13.51 miles. This corresponds closely to the known length of the full line, which is 13.50 miles.

On this chart, as well as on charts No. 1 and No. 2, it will be noted that there is a reverse peak which, if it were taken into consideration in the determination of F_a, would indicate twice the length of line. This doubling of the total number of peaks is characteristic of a line on which the major indication is secured through the metallic return circuit afforded by a phase-to-phase short and the secondary peaks are the result of reflections in the circuit comprising the total length of conductor involved.

Non-Ferrous Silver Brazing in Electric Furnace

Low-Melting Point Silver-Brazing Alloy and Flux Permits Quantity Production

By W. K. RANKIN
Switchgear Division
General Electric Company, Philadelphia



New alloy widens field of furnace brazing

Tray being pushed into heating chamber contains bushings for insulator supports (insert), which are supported and separated by blocks. Electric furnace takes trays 32 in. long. Slide way is built around furnace so hot pans will not require lifting.

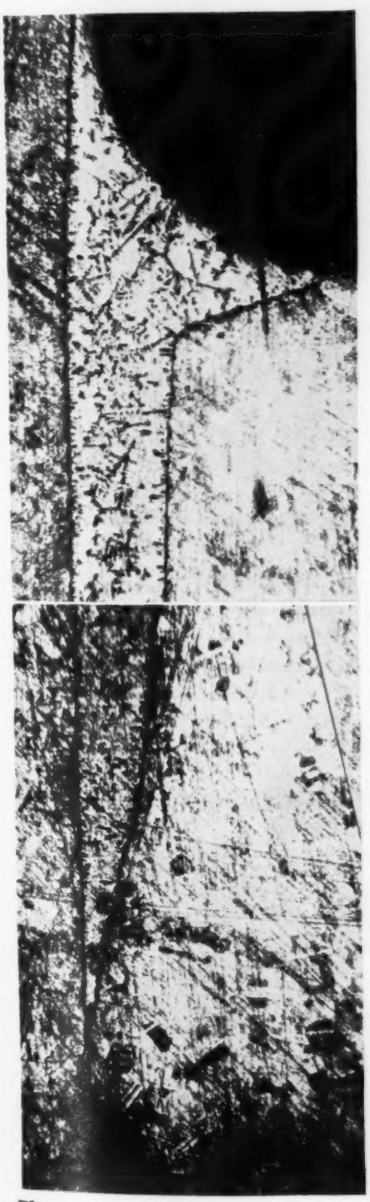


Photo-micrograph shows penetration of silver-brazing alloy into the joint of a bushing for insulator support

WITH the introduction recently of a new low-melting point silver-brazing alloy and flux it is believed that furnace brazing may become as practical a process for the fabrication of brass and bronze parts as the well-known copper brazing of steel and iron parts in a furnace with a hydrogen atmosphere.

Previously, fabrication of brass and bronze usually had been accomplished by the electric arc or by manual welding with some type of gas torch. A considerable degree of skill in manipulation of the brazing alloy and an accurate judgment of temperature are required if an acceptable product is to be obtained. Furthermore, the flow point of the silver-brazing alloy and flux formerly in use approached closely the temperature at which the brasses and bronze become plastic; silver brazing in a furnace, therefore, would have been a very slow process as the temperature used would be but little higher than the flow point of the brazing alloy and flux.

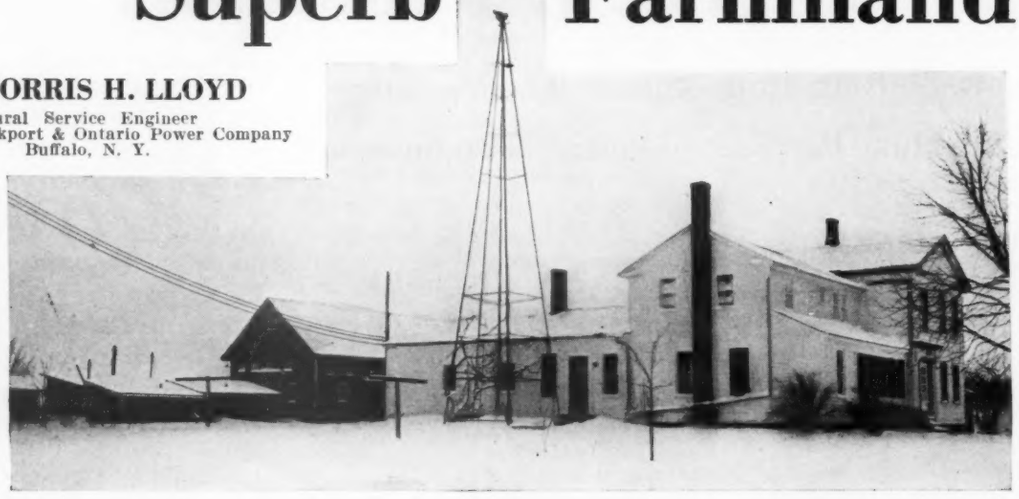
Experimental work using the new low-melting point silver-brazing alloy *without* flux was first carried on in a hydrogen atmosphere furnace, on brass containing 65 per cent copper and 35 per cent zinc. Results were unsatisfactory, so further experiments in a hydrogen atmosphere were discontinued as there seemed to be no point in using hydrogen if flux also were used. Best results were obtained in brazing brass with the low temperature silver brazing alloy and flux in a furnace that had a neutral atmosphere.

Work so far had been carried on in a small laboratory furnace which limited the amount of regular production brazing that could be completed. Various kinds of furnaces were investigated and final choice of a suitable furnace was based on the probability that it would be necessary to do copper brazing and bright annealing with the furnace, in addition to the silver brazing. A General Electric standard batch-type furnace for copper brazing and high temperature heat treating in protective atmosphere

[*Continued on page 91*]

Elec Swift Makes a Superb Farmhand

By MORRIS H. LLOYD
Rural Service Engineer
Niagara, Lockport & Ontario Power Company
Buffalo, N. Y.



Comprehensive Two-Year Test on New York Farm Shows Electricity at a Dollar a Day Equals Two Able-Bodied Farmhands

For two years the energy consumption on a typical dairy-poultry farm, that of Ralph W. Brundage at Oakfield, N. Y., has been metered in such detail that comparisons with production and labor saving can be made as never before. We believe the comprehensive data from this 185-acre, 25-cow, 1,200-hen farm will give every rural load-builder new working tools to put kilowatt-hours on our steadily expanding national rural network with benefit to farmers.

ELECTRICITY, as a farmhand, has completed a two-year scientific test at a demonstration dairy and poultry farm established by the Niagara-Hudson System with the help of Ralph W. Brundage, established farmer of Oakfield, in western New York. Today Mr. Brundage says electricity has done the work of two full-time, able-bodied farmhands and has cost him in 1936 less than $1 a day for both farm and residence use.

Mr. Brundage operates his 185-acre dairy and poultry farm as a business. His farm was chosen for experimental purposes after investigation of many possibilities. The farm maintains 25 cows and 1,200 laying hens. It is no more "prettied" than its neighbors. The wiring in both residence and outbuildings was above average and the number of electrical labor-saving appliances in use was already liberal.

The Niagara, Lockport & Ontario Power Company, of the Niagara-Hudson System, loaned Mr. Brundage sufficient additional appliances to complete the electrification of the home, the poultry and dairy plants, for a period of five years. Mr. Brundage has the use of the equipment, in return for which he keeps a record of work done and kilowatt-hours used for each appliance each month and permits the farm to be inspected by the public.

Before inception of the demonstration project, Mr. Brundage had the following appliances in his farm buildings: Poultry house lighting, milker, water pump, 5-hp. portable motor and feed grinder and a tool grinder. To these applications were

Ralph W. Brundage adjusts his electric chick brooder

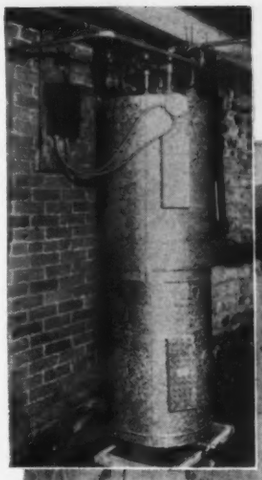
Table I—Annual Consumption and Cost of Energy Used at Brundage Farm

November 1, 1935, to November 1, 1936

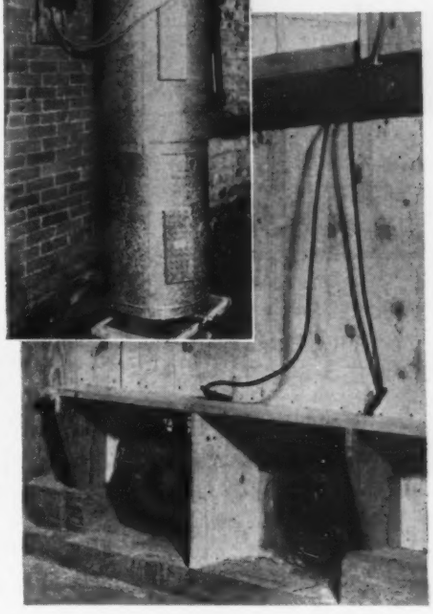
	Electricity Used During Year Kw.-Hr.	Cost to Customer	Average Monthly Consumption	Average Monthly Cost	Average Daily Cost	Average Cost per Kw.-Hr., Cents
Residence	7,160	$124.48	597	$10.37	$0.34	1.74
Poultry farm	7,622	132.51	635	11.04	0.362	1.74
Dairy farm	5,972	103.82	497	8.65	0.284	1.74
Portable motor	177	3.08	15	0.26	0.008	1.74
Total	20,931	$363.89	1,744	$30.32	$0.994	1.74

These costs are computed on standard residential and farm rate:

For all or any part of the first 12 kw.-hr. per month the charge is	$1.50 net
For each of the next 48 kw.-hr. per month the rate per kilowatt-hour is	4½c. net
For each of the next 140 kw.-hr. per month the rate per kilowatt-hour is	2½c. net
For all kilowatt-hours in excess of 200 per month the rate per kilowatt-hour is	1½c. net



Water heater on Brundage farm used 3,041-kw.-hr.



Dairy barns are ventilated by electric fans

added two incubators, battery brooder, three hover-type brooders, six poultry warmers, milk cooler, dairy utensil scalder, dairy stable ventilating fans, as well as a hay hoist and ensilage cutter for use with the motor.

In his home Mr. Brundage has a range, refrigerator, washer, iron, sewing machine and two lamps, one certified-light student lamp and one indirect type floor lamp.

All electricity used on the farm is billed on the regular, rural residence rate, thus insuring the value of the

Table II—Energy Consumption Record by Months

	1935 Nov.	Dec.	1936 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Yearly
Master meter, entire farm	**1,194**	**1,487**	**1,808**	**2,578**	**2,733**	**2,640**	**2,078**	**1,693**	**1,080**	**1,116**	**1,392**	**1,132**	**20,931**
Master meter, residence	**614**	**707**	**680**	**601**	**658**	**624**	**567**	**470**	**402**	**521**	**667**	**649**	**7,160**
Lighting and small appliances	179	211	223	165	171	140	118	82	64	85	114	150	1,702
Range	162	170	156	118	154	174	164	128	100	125	203	193	1,847
Water heater	238	280	255	278	282	261	235	203	177	260	303	269	3,041
Refrigerator	18	30	30	27	36	29	38	40	51	37	33	25	394
Ironer	5	7	5	3	6	8	4	8	2	5	7	4	64
Iron	0	0	0	0	1	1	0	3	3	1	3	0	12
Washer	6	5	5	6	4	7	6	4	4	6	3	4	60
Radio	6	4	6	4	4	4	2	2	1	2	1	4	40
Master meter, poultry farm	**80**	**239**	**604**	**1,502**	**1,617**	**1,519**	**1,025**	**527**	**14**	**184**	**262**	**49**	**7,622**
Poultry house lights (all night)	22	13	13	13	12	0	0	0	5	0	0	0	81
Poultry house lights (time switch)	40	69	94	72	34	0	0	0	0	0	46	22	377
Poultry water warmers	8	125	139	119	32	18	1	0	0	0	0	2	444
Incubators	0	0	330	945	774	685	702	462	0	176	213	0	4,287
Battery brooder	0	0	0	0	39	183	82	39	0	0	0	0	343
Hover brooders	0	0	0	314	630	528	214	0	0	0	0	0	1,688
Brooder house lights and water warmers	0	0	0	10	49	64	0	0	0	0	0	0	123
Miscellaneous lights	5	14	17	25	46	39	22	14	8	7	1	13	211
Shop	5	18	11	4	1	2	4	9	1	1	2	12	70
Master meter, dairy farm	**472**	**515**	**484**	**455**	**451**	**497**	**486**	**684**	**641**	**411**	**442**	**434**	**5,972**
Barn lighting and small appliances	114	154	128	101	65	120	34	77	69	37	57	92	1,048
Milking machine	113	113	125	113	126	101	102	87	97	76	82	102	1,237
Dairy utensil scalder	100	104	114	95	175	181	110	83	100	80	87	98	1,327
Milk cooler	73	9	0	0	0	0	142	176	225	138	141	0	904
Water pump	72	75	62	72	75	95	98	261	150	80	75	142	1,257
Dairy stable ventilator fans	0	60	55	74	10	0	0	0	0	0	0	0	199
Portable farm motor	**28**	**26**	**40**	**20**	**7**	**0**	**0**	**12**	**23**	**0**	**21**	**0**	**177**
Silo filling	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	.....	21
Feed grinding	28	26	40	20	7	.....	.....	.....	.....	.....	.....	.....	121
Hay hoisting	.....	.....	.....	.....	.....	.....	.....	12	13	.....	.....	.....	25
Wheat hoisting	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	10
Maximum demand, entire farm, in Kw.	**10.0**	**10.0**	**11.0**	**13.5**	**13.0**	**13.5**	**13.5**	**9.0**	**8.0**	**9.0**	**8.5**	**8.0**	**10.4 Avg.**
Max. demand, residence	5.0	5.0	5.0	6.0	6.0	7.0	7.0	5.0	6.0	6.0	6.0	6.0	5.8
Max. demand, poultry farms	0.7	1.4	2.8	3.6	3.8	3.6	3.8	1.5	0.3	1.2	1.2	1.3	2.1
Max. demand, dairy farms	5.8	5.4	5.3	5.4	5.4	5.4	5.4	4.6	7.0	7.0	4.8	4.4	5.5
Max. demand, portable motor	5.0	5.0	5.0	5.0	5.0	0.0	0.0	3.0	3.0	0.0	5.0	0.0	3.0
Demand factor, per cent	**28.2**	**28.2**	**31.2**	**38.2**	**36.7**	**36.8**	**36.8**	**25.5**	**22.5**	**25.5**	**24.1**	**22.6**	**30.4**
Load factor, per cent	**16.4**	**20.0**	**22.1**	**26.4**	**28.2**	**26.3**	**20.6**	**26.1**	**18.1**	**16.6**	**22.8**	**19.1**	**22.9**

Table III—Consumption and Cost of Energy for Individual Home and Farm Uses

Average cost is 1.74 cents per kilowatt-hour for all uses

(See Table II for Breakdown by Months)

Individual Uses	Yearly Kw.-Hr. Consumption	Yearly Cost	Avg. Monthly Consumption	Avg. Monthly Cost	Individual Uses	Yearly Kw.-Hr. Consumption	Yearly Cost	Avg. Monthly Consumption	Avg. Monthly Cost
Entire farm	20,931	$363.89	1,744	$30.32	Hover brooders	1,686	$29.35	140	$2.44
Residence	7,160	124.48	597	10.37	Brooder house lights and water warmers	123	2.14	10	0.18
House lighting and small appliances	1,702	29.60	142	2.46	Miscellaneous lights	211	3.67	18	0.30
Range	1,847	32.10	154	2.68	Shop	70	1.21	6	0.10
Water heater	3,041	52.87	254	4.40	Dairy farm	5,972	103.82	497	8.65
Refrigerator	394	6.85	33	0.57	Barn lighting	1,048	18.23	87	1.52
Ironer	64	1.11	5	0.09	Milking machine	1,237	21.51	103	1.79
Iron	12	0.21	1	0.02	Dairy utensil scalder	1,327	23.06	110	1.92
Washer	60	1.04	5	0.09	Milk cooler	904	15.72	75	1.31
Radio	40	0.70	3	0.06	Water pump	1,257	21.85	105	1.82
Poultry farm	7,622	132.51	635	11.04	Dairy ventilator fans	199	3.46	17	0.29
Poultry house lights (all night)	81	1.41	7	0.12	Portable motor	177	3.08	14.63	0.26
Poultry house lights (time switch)	377	6.55	31	0.55	Silo filling	21	0.36	1.75	0.03
Poultry water warmers	444	7.72	37	0.64	Feed grinding	121	2.11	10.01	0.18
Incubators	4,287	74.50	357	6.21	Hay hoisting	25	0.44	2.04	0.04
Battery brooders	343	5.96	29	0.50	Wheat hoisting	10	0.17	0.83	0.01

Table IV—Work Record on the Brundage Demonstration Farm

	1935 Nov.	Dec.	1936 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Yearly
Residence													
Individual meals served	540	550	558	522	558	540	540	540	405	400	540	550	6,243
Gallons water heated	550	540	490	520	570	520	800	730	660	700	780	520	7,380
Individual washings and ironings	30	24	24	24	24	30	24	25	20	24	30	24	303
Poultry farm													
Number hens lighted (all night lighting)	200	200	200	200	195	.....	.....	.....	.....	.....	.....	.....	200 Avg.
Number days lights used	30	31	31	29	31	.....	.....	.....	.....	.....	.....	.....	152
Number hours used daily	24	14	14	14	12	.....	.....	.....	.....	.....	.....	.....	15½ Avg.
Number hens lighted (time switch control)	340	330	755	750	730	.....	.....	.....	.....	.....	680	500	441 Avg.
Number days lights used	30	31	31	29	24	.....	.....	.....	.....	.....	30	31	206
Number hours used daily	3½	5	4½	4	2½	.....	.....	.....	.....	.....	2½	2½	3½ Avg.
Hens receiving warmed water	750	970	955	950	730	900	.....	.....	.....	.....	.....	.....	901 Avg.
Days water warmers used	1	31	31	29	31	15	.....	.....	.....	.....	.....	.....	138
Number hours used daily	24	24	24	24	24	24	.....	.....	.....	.....	.....	.....	24 Avg.
Number water warmers in use	.....	8	8	8	6	6	.....	.....	.....	.....	.....	.....	7 Avg.
Days incubators used—No. 1	.....	.....	13	29	31	30	31	30	.....	15	21	.....	200
—No. 2	.....	.....	5	29	31	30	31	30	.....	.....	.....	.....	156
Eggs placed in incubators	.....	.....	1,956	3,746	6,144	3,696	4,496	1,396	.....	1,644	.....	.....	23,098
Chicks hatched	.....	.....	.....	1,490	4,130	3,680	2,670	3,655	.....	.....	885	.....	16,510
Days battery brooder used	.....	.....	.....	.....	few	13	12	18	.....	.....	.....	.....	43
Chicks brooded, avg.	.....	.....	.....	.....	few	216	223	192	.....	.....	.....	.....	508 Net
Days hover brooders used	.....	.....	.....	21	31	30	31	.....	.....	.....	.....	.....	113
Chicks brooded, avg.	.....	.....	.....	544	745	658	746	.....	.....	.....	.....	.....	1,461 Net
Number brooders in use	.....	.....	.....	2	3	3	3	.....	.....	.....	.....	.....	3 Avg.
Dairy farm													
Number cows milking	21	20	23	24	26	28	27	28	27	22	22	27	24.5 Avg.
Number gallons milk cooled	1,000	1,000	0	0	0	0	1,900	2,400	2,260	1,600	1,850	0	12,010
Temperature reduction	40°	40°	.....	.....	.....	.....	40°	55°	55°	50°	50°	.....	40°
Gallons water pumped (est.)	57,600	60,000	49,600	57,600	60,000	76,000	78,400	104,400	60,000	32,000	30,000	56,800	722,400
Number hours ventilation system used	.....	500	430	600	70	.....	.....	.....	.....	.....	.....	.....	1,600
Portable motor													
Tons ensilage stored	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24	.....	24
Pounds grain ground (est.)	2,800	4,000	3,200	3,000	800	.....	.....	.....	.....	.....	.....	.....	13,800
Tons hay hoisted	.....	.....	.....	.....	.....	.....	.....	33	33	.....	.....	.....	66
Tons unthreshed wheat hoisted	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	28
Monthly bill	$22.07	$26.46	$31.28	$42.83	$45.16	$43.76	$35.33	$29.56	$20.36	$20.90	$25.04	$21.14	$363.89
Cost per day	$ 0.73	$ 0.88	$ 1.01	$ 1.48	$ 1.45	$ 1.46	$ 1.14	$ 0.79	$ 0.68	$ 0.67	$ 0.85	$ 0.68	$ 0.99
Average rate, cents per kw.-hr.	1.85	1.78	1.73	1.66	1.65	1.66	1.70	1.74	1.88	1.87	1.80	1.86	1.74

experiment to other farms in the state.

Accomplishments of electricity on the Brundage farm for one year:

16,510 chicks hatched out of 23,098 eggs at a cost of $0.0045 each for hatching.

1,461 chicks brooded in hover brooders (sixteen weeks) at 2 cents each.

The cooling of 1,201 cans of milk in a year for $15.72.

The pumping of 722,400 gal. of water for $21.85, or 3 cents per 1,000 gal.

An average of 25 cows were milked twice a day for the year at a cost of 7 3/10 cents per cow per month.

Sixty-six tons of hay were hoisted into the mow for 44 cents. The portable motor also hoisted 28 tons of wheat for 17 cents and ground 6.9 tons of feed for $2.11. Filling the silo with 24 tons of ensilage cost 36 cents.

Throughout most of the winter Mr. Brundage and his tenant farmer do all the farm work. A third man works

Table V—Domestic Consumption Record of the R. W. Brundage Demonstration Farm

	Year	Month	Day	Unit
House lighting and small appliances				
Total kw.-hr.consumption	1,702	142	4.65	
Cost for energy	$29.60	$2.46	$0.081	
Range				
Total kw.-hr.consumption	1,847	154	5.05	
Consumption—each person	313	26	0.85	0.301/meal
Cost for energy—family	$32.10	$2.46	$0.088	$0.031/meal
Cost for energy—each person	$ 5.35	0.41	$0.015	$0.0051/meal
Total meals served—family	6,243	520	17.1	
Total meals served—each person	1,040	86.6	2.8	
Water heater				
Total kw.-hr.consumption	3,041	253	8.3	0.512/gal.
Consumption—each person	507	42.2	1.39	
Cost for energy—family	$52.87	$4.40	$0.144	$0.007/gal.
Cost for energy—each person	$ 8.81	$0.733	$0.024	
Total gallons water heated—family	7,380	615	20.2	
Gallons water heated—each person	1,230	10.25	3.36	

	Year	Month	Day	Unit
Refrigerator				
Total kw.-hr.consumption—family	394	32.8	1.08	
Consumption—each person	65.6	5.47	0.18	
Cost for energy—family	$6.85	$0.57	$0.019	
Cost for energy—each person	$1.14	$0.095	$0.003	
Washer				
Total kw.-hr.consumption	60	12		
Cost for energy	$1.04	$0.09		
Number individual washings	303	25.3		
Ironer and iron				
Total kw.-hr.consumption	76	6.33		
Cost for energy	$1.32	$0.11		
Number individual ironings	303	25.3		
Radio				
Total kw.-hr. consumption	40	3.33		
Cost for energy	$0.70	$0.06		

Table VI—Poultry Farm Consumption Record at Brundage Farm

	Year	Month	Day	Unit
Poultry house lights (all night) (5 months)				
Total kw.-hr. consumption	81	16	0.53	0.405 per hen
Cost for energy	$1.41	$0.28	$0.009	$0.007 per hen
Number hens lighted		200		
Poultry house lights on time switch (7 months)				
Total kw.-hr. consumption	377	54	1.83	0.855 per hen
Cost for energy	$6.55	$0.94	$0.032	$0.015 per hen
Number hens lighted		441		
Poultry water warmers (6 months)				
Total kw.-hr. consumption	444	74	3.21	0.493 per hen
Cost for energy	$7.72	$1.29	$0.056	$0.0086 per hen
Number hens drinking		901		
Electric incubators (2) (8 months)				
Total kw.-hr. consumption	4,287	536	21.44	0.259 per chick
Cost for energy	$74.50	$9.31	$0.372	

	Year	Month	Day	Unit
Number eggs set	23,098			
Cost per egg set				$0.00322
Number chicks hatched	16,510			
Cost per chick hatched				$0.00451
Percentage of hatch, 71.5				
Battery brooder (7 weeks)				
Total kw.-hr. consumption	343	196	8.0	0.675 per chick
Cost for energy	$5.96	$3.41	$0.139	$0.0117 per chick
Number chicks brooded	508			
Hover brooders (16 weeks)				
Total kw.-hr. consumption	1,686	421	14.9	1.15 per chick
Cost for energy	$29.35	$7.44	$0.26	$0.02 per chick
Number chicks brooded	1,461			
Farm shop				
Total kw.-hr. consumption	70	6		
Cost for energy	$1.21	$0.10		

Table VII—Consumption Record of Brundage Dairy Farm

	Year	Month	Day	Unit
Milking machine				
Total kw.-hr.consumption	1,237	103	3.38	1.69 per milking
Consumption—each cow	50.5	4.2	0.138	0.079 per milking
Cost for energy—herd	$21.51	$1.79	$0.059	$0.029 per milking
Cost for energy—each cow	$ 0.88	$0.073	$0.0024	$0.0012 per milking
Number of cows milked (avg.)	17,934	1,495	49	24.5
Milk cooler (7 months)				
Total kw.-hr.consumption	904	129	3.69	0.75 per can
Consumption—each cwt.				0.884 per cwt.
Cost for energy	$15.72	$2.25	$0.064	$0.013 per can
Cost for energy—each cwt.				$0.0154 per cwt.
Number pounds milk cooled	102,085	14,569	417	
Number cwt. milk cooled	1,021	145.7	4.17	
Number cans milk cooled	1,201	171.5	4.91	
Dairy utensil scalder				
Total kw.-hr. consumption	1,327	110	3.62	
Cost for energy	$23.06	$1.92	$0.063	

	Year	Month	Day	Unit
Water pump				
Total kw.-hr. consumption	1,257	105	3.43	1.74 per 1,000 gal.
Cost for energy	$21.85	$1.82	$0.06	$0.03 per 1,000 gal.
Gallons water pumped (est.)	722,400	60,200	1,975	
Barn lighting				
Total kw.-hr. consumption	1,048	87	2.86	
Cost for energy	$18.23	$1.52	$0.05	
Barn ventilating system (4 months)				
Total kw.-hr. consumption	199	50	2.11	
Cost for energy	$3.46	$0.835	$0.035	
Number hours operation	1,600			
Number days used	90			

part time when needed and full time in summer. With, of course, his farmhand, electricity, this constitutes the entire force except for such extra help as is hired for seasonal work, such as grading potatoes.

Mrs. Brundage, aided by her electric appliances, finds ample time not only to care for her three children, who are of grade school age; to bake the family bread supply, and do all the other household duties of the farm, but to engage in activities of the Genesee County Home Bureau, of which she was chairman last year.

Let the tabulated details tell the story for the period between the November firsts of 1935 and 1936.

Table VIII—Feed Grinding Is Principal Portable Motor Use

Type of Work	Quantity per Year, Tons	Kw.-Hr. Used	Total Cost	Kw.-Hr. per Unit	Cost per Unit
Silo filling	24	21	$0.36	0.875	$0.015
Feed grinding	6.9	121	2.11	17.52	0.306
Hay hoisting	66	25	0.44	0.38	0.0067
Wheat Hoisting	28	10	0.17	0.36	0.0061

Commercial Load Factors

Survey Shows Load per Customer Averages 2.12 Kw., Load Factor 32.4 Per Cent, Diversity Factor 1.1 and Annual Energy Use 6,014 Kw.-Hr.

ACCURATE knowledge of load factors and diversity factors is essential for the proper study of load growth and of investment necessary to supply service. In the past our ideas of these important factors were based usually on general knowledge of total loads, and the feeling has grown that more adequate and comprehensive study should be made along these lines. Accordingly, the Commonwealth Edison Company has devoted considerable time and thought to these tests which started in December, 1934, and are still in progress. The same method that was used some four years ago in the study of residence load characteristics was used in this survey of retail commercial customers.*

* "Residence Load Characteristics Based on Field Studies," by G. L. Jorgensen and R. L. Matteson, ELECTRICAL WORLD, November 19, 1932, page 684.

Where the tests

Group A—The customers in this test are in one of the largest shopping centers in Chicago. Shops in this district are of the smaller type. The maximum for the year occurred on December 21, 1935, at 6:30-7 p.m., which was the Saturday preceding Christmas and the same day as the maximum for this class of commercial customers as a group.

Group B—This is a group of fairly large customers in an important neighborhood business district at the intersection of three important streets. The patrons of this district are in the medium-income class. The maximum load occurred on December 7, 1935, at 7:30 p.m.

Group C—The sixteen customers in this test are in a large shopping district patronized by the low-income group. In contrast to the other tests, there is no power load large enough to necessitate a power transformer. The small amount of power used is from the lighting transformer. The relatively large proportion of light probably accounts for the lower than average load factor. The maximum occurred on December 7, 1935, at 8:30 p.m.

Group D—This test is an example of small neighborhood stores near an "L" station. In this location there is a considerable power load, much of which is refrigeration. The

Disclosed by Field Study

By GEORGE L. JORGENSEN . . . RALPH L. MATTESON
Assistant Statistician — Statistical Engineer
Commonwealth Edison Company, Chicago, Ill.

A careful preliminary field inspection was made and resulted in the selection of eight typical locations about the city. Included are samples of customers large and small, ranging from the low to the higher income classes, and for both densely and sparsely settled locations. The sum total of all of these make a good cross-section of the class as a whole.

How the tests were made

Housings were constructed and mounted on the poles near the transformers. In them was installed eight-day recording watt-hour metering equipment. A regular weekly schedule for removing charts and inspection of equipment was strictly maintained. Very little trouble was experienced, outages being at a minimum. These meters were of the type that carry a round waxed chart, integrating the

were conducted

maximum load occurred on December, 1935, at 6 p.m.

Group E—This test covers a busy retail district patronized by many families with small incomes. The connected load is high, but the merchants, operating as economically as possible, hold down the electricity consumption. The maximum occurred on December 14, 1935, at 7:30 p.m.

Group F—This test is on a group of customers similar to those in Group "D," except that they are in general smaller. The maximum occurred on December 21, 1935, at 6:30 p.m.

Group G—The 47 customers of this block are in the center of a large neighborhood shopping district of better than average class. It is the only location tested in which the load around Christmas did not exceed that of the months following the holidays of the preceding winter. However, they are a sample of substantial and prosperous stores of the larger type having a load factor that is above average. The maximum load occurred on February 23, 1935, at 8 p.m.

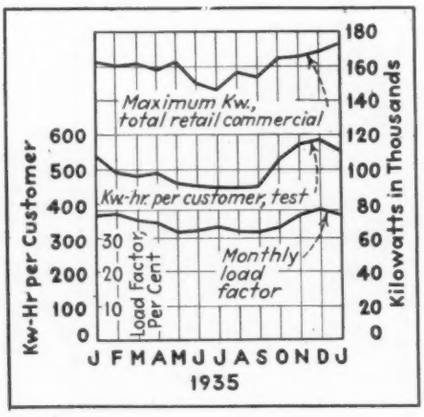
Group H—The test here is in the same neighborhood as Group "A," and the customers are similar except for size, the average customer here being about twice as large as in "A." The maximum occurred on December 21, 1935, at 7:30 p.m.

load for a ½-hour period, the stylus then returning to the zero line and starting over again.

While a large part of the power supplied to the customers of this class is taken from the lighting transformer (small motors and appliances), still, of course, there are a considerable number of motors of 1 hp. or over that are fed from separate power banks. It was necessary to isolate the secondaries feeding the test customers from these power transformers and install similar metering equipment so that the characteristics of all energy used could be determined. Sixteen metering sets in all were used.

As was to be expected, it is practically impossible to find a 100 per cent retail commercial group of customers fed from a single transformer.

[*Continued on page 136*]


Maximum Kw., total retail commercial
Kw-hr. per customer, test
Monthly load factor
Load Factor Per Cent
Kw-Hr per Customer
Kilowatts in Thousands
J F M A M J J A S O N D J
1935

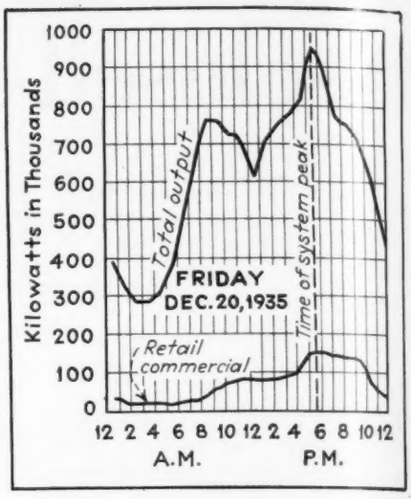
Total class load calculated on data from test customers

Load factor of the test customers is applied to the total kilowatt-hours for all retail commercial customers to arrive at the monthly maximums for this class of service. Times of registration of the kilowatt-hours of the test customers and of the total class are not coincident, because the total of kilowatt-hours sold is from readings taken on scheduled reading days spread through the month. Load factor as found on the test customers is based on kilowatt-hours registered by those customers from the middle of one month to the middle of the next. This compensates, for all practical purposes, for the spread of reading days over the working days in a given month.

Average of kilowatt-hours per customer for the test customers is somewhat higher than for the class as a whole. This curve (Fig. 1) shows the expected seasonal drop from the first of the year until April, and then, because of the change in time in Chicago, the drop becomes more rapid until summer. The change back to standard time in September marks the start of the seasonal increase that month and it continues rapidly until December.

Monthly load factor shows a comparatively slight change from one month to the next, being around 38 per cent in the maximum winter month and dropping to about 32 per cent during the minimum summer month.

It will be noted that the monthly maximum loads as calculated for the total class change but little, from month to month, during the year, the lowest month being July. The highest maximum occurred on the Saturday preceding Christmas for both years studied.

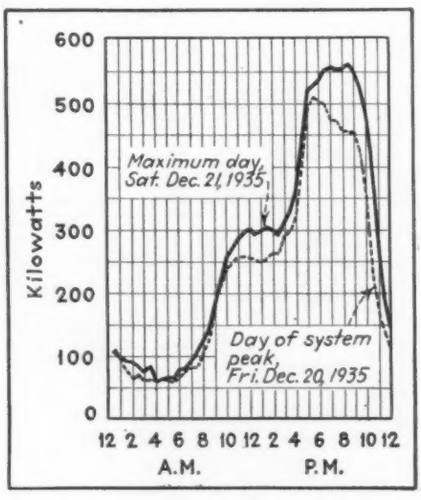


Retail commercial contribution to system peak

The relationship of the total load of all the company's customers with that of the retail commercial class on the day of the system peak, which was December 20, 1935, is shown (Fig. 3). While this class of service comprises only about 22 per cent of the total load, still its contribution to the system peak is 100 per cent of the possible since its "diversity" for this day is unity. However, this portion of the company's total load does play an important part in holding up the daytime load and also the evening load after the peak until 10 p.m., and more particularly on the days when retail stores are open evenings.

Load Characteristics of Retail Commercial Customers

	Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H	All Groups
Number of customers.....	44	30	16	25	30	33	47	27	252
Ave. kw-hr./cust./yr.....	5,345	6,576	6,912	4,847	5,560	3,504	7,299	8,363	6,014
Ave. max. load/cust. (kw.).	1.65	2.72	3.88	1.76	3.71	1.37	2.36	3.11	2.3
Annual load factor (%)....	42.2	29.4	24.4	33.5	20.6	31.9	36.2	33.4	32.4
Diversity factor.....	1.1	1.16	1.3	1.03	1.28	1.09	1.08	1.17	1.1

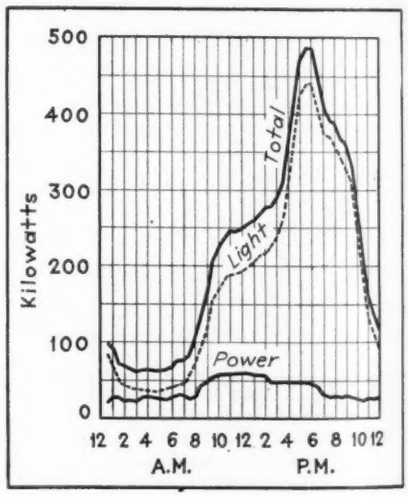


Retail commercial peak load not on same day as system peak

Although the peak of the retail commercial load on the day of the system peak as indicated by this graph (Fig. 2) of data from test customers occurs coincidently with the system maximum, the maximum load for this class of service occurs on the Saturday before Christmas. This is true for both winters in which the test was made.

The diversity, as regards the system peak, shown on the above curve is 1.10 for the year of 1935 and for the year previous was 1.18. The annual load factor of the test customers based on the peak shown here and the kilowatt-hours for the calendar year 1935 is 32.4 per cent and for the previous year the annual load factor on the same basis was 32.6 per cent.

This chart also illustrates the difference in the shape of the curve for this class of business as between Friday and Saturday. Retail stores are normally open Tuesday, Thursday and Saturday evenings. On days when stores are open evenings the curve is higher throughout the entire evening period and has a load peak from 6 to 9 p.m. On the other days the peak is quite sharp at 5:30 to 6 p.m. and is coincident with the system peak.



Composition of the retail commercial load

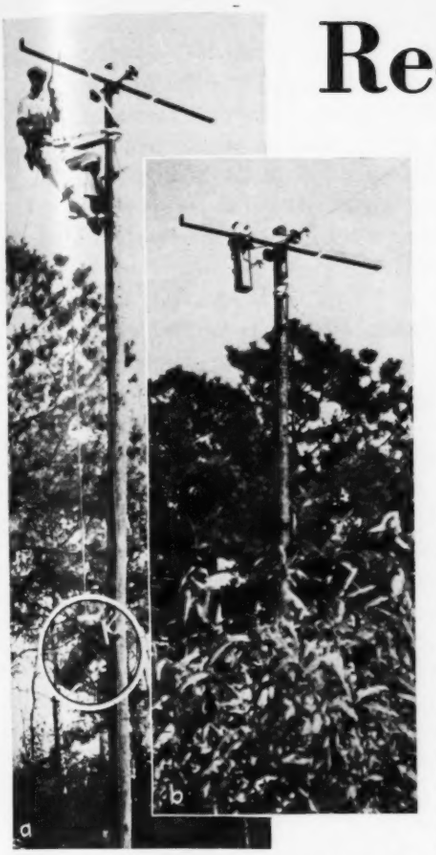
A careful survey was made of the connected load of each individual customer included in these tests. From a check of the lighting and power units used and from the owner's statements of the time of day and length of time of the use of such lighting and power units the division between lighting and power was made. This resulted in the total annual kilowatt-hour use being indicated, 74 per cent for lighting and 26 per cent for power and appliances.

From this same information the daily load curve for retail commercial business was divided between the lighting and power use as shown on this curve. This shows that the power peak occurs in the morning hours and that the lighting peak occurs from 5:30 to 6 p.m. coincident with the system peak.

Reclosers Sectionalize Distribution Lines

Selective Tripping Is Afforded by Tapered Ratings So Fault Can Be Isolated and Major Service Sustained

By E. H. BECKERT
Switchgear Division, General Electric Company, Philadelphia



(a and b) Pole mounting of FP.19 oil circuit recloser on 18-mile rural line of Carolina Power & Light Company

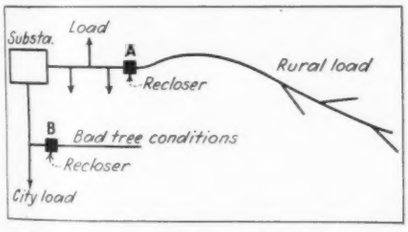


Fig. 1—Rural faults do not affect urban service

Oil circuit recloser at A prevents interruption of city load in case of fault in rural area. Also, by reclosing quickly after non-persisting fault, improves service on rural line. At B recloser relieves remainder of distribution system from interruption which might result from faults in a circuit having bad tree conditions.

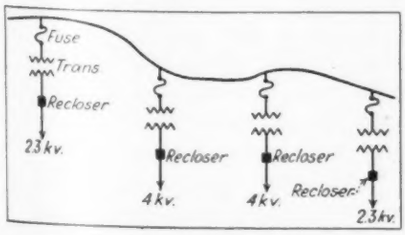


Fig. 2—Reclosers prevent transformer burnouts

Reclosers in the secondary of distribution transformers feeding communities prevent transformer burnouts. Faults are interrupted and service quickly restored in districts difficult of access during the winter, with obvious economical improvement in service. Interruption of service only in case of persisting faults.

INTRODUCED about 2½ years ago, the oil circuit breaker was intended to improve distribution service on city, suburban and rural distribution lines. Since that time more than 900 of these devices have been purchased, the usual applications being those described in the ELECTRICAL WORLD of October 27, 1934, in an article by Messrs. R. M. Spurck and D. K. Blake. As a brief review, these applications are covered in Figs. 1 and 2.

Starting out with a 50-amp. device which had a minimum trip of 140 amp., the 25-, 15-, 8- and 4-amp. devices with minimum trips of 70, 45, 30 and 15 amp., respectively, have been successively demanded and produced. These lower capacities, with their correspondingly lower trip points, have suggested a new application; that is, the use of reclosers of different ampere rating at different points have suggested a new application—the use of reclosers of different ampere ratings at different points in a single distribution line for sectionalizing purposes. In this way selective tripping is obtained to preserve service over the entire line or a portion of it, depending upon the nature and location of the fault. Due to their different trip points the lower rated devices will trip ahead of the higher rated devices.

It will be remembered that the oil circuit recloser acts very much the same as an automatic reclosing oil circuit breaker; that is, it trips out on overcurrent, recloses again after a short interval and, if the fault has disappeared, remains closed. If the fault still exists, it trips again and continues in these cycles until there have been three reclosures, when, if the fault still exists, the recloser trips out again and is locked out. It must then be reclosed manually, and such reclosure automatically resets it for a complete new cycle of operations. It differs from an automatic reclosing oil circuit breaker in that it is self-contained and requires no external source of power to reclose it automatically. It is also smaller and of less interrupting rating.

In the illustrations are varieties of

[*Continued on page 112*]

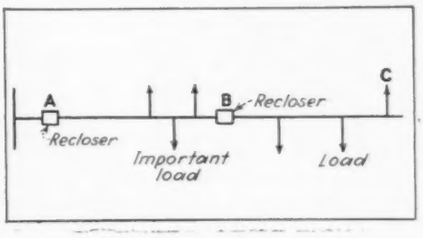


Fig. 3—Distribution feeder with loads at intervals

A very important and relatively heavy load is taken off just ahead of point B, and it is particularly desirable to maintain service for this load. Let us assume that the current through the line at point A is 45 amp. and at point B only 12 amp. In such case a 50-amp. recloser is placed at the head of the line, point A, and a 15-amp. recloser just beyond the important load, at point B. In case of a non-persisting fault in section AB the recloser at A opens and recloses once, twice or three times, preserving service over the whole line. In case of a non-persisting fault in section BC the recloser at B performs in a similar manner and service is maintained over the entire line. If a persisting fault occurs in section AB the recloser at A recloses three times, then trips and locks out, and service is, of course, interrupted over the entire line until the fault condition is corrected. Should a persisting fault occur in section BC the recloser at B will lock out after a similar cycle, but the recloser at A remains closed. In this case service is interrupted over section BC only. There is no interruption of service in section AB, thus illustrating the advantage of placing at B a smaller recloser with a lower trip point than the recloser at A. When we speak of faults in section AB or BC we mean also faults in the branches of these sections when such branches are not provided with fuses coordinated to blow before the reclosers trip.

Editorials

HOWARD EHRLICH . EDITOR

"Value" Starts on Another Cycle?

FOR SOME YEARS the utility industry has proceeded under the regulatory policy that utility rates should permit a fair return on the value of the property used and useful in rendering service. Some forty years ago this principle was laid down in a relatively obscure case, and while our courts have been interpreting the principle through the years, the utility companies have been growing into strong, sound properties and the customer has been buying service at an ever lowered price.

It used to be that in a period of falling prices regulatory bodies were urged by anti-utility interests to adopt the reproduction-cost-new-less-depreciation principle for establishing values on which to base rates, but of late years this same group has expounded a new policy, namely, that of return on original cost value.

The present situation presents an amusing anomaly, for as the original cost principle is thrust more and more upon the companies, the new construction will go on their books in accordance with the rising prices generally forecast for the next few years. After the price level begins a long term swing downward will the adherents of original cost then cry aloud for reproduction-new-less-observed depreciation?

•

Chicago Gets the Electric Range at Last

IN THE second largest city in the United States, where George Hughes, the father of electric cooking, established the factory which has grown into the largest single producer of electric ranges in the world, that crowning service of electricity in the home has been for all these years practically unknown. But it will no longer remain unknown, for on March 15 the Commonwealth Edison Company, in co-operation with distributors, dealers and contractors, began the first organized effort to sell electric ranges in Chicago.

The beginning of range sales in Chicago is most auspicious. Electricity rates are low; 2 cents per kilowatt-hour for domestic energy usage above 100 kw.-hr. per month. Chicago people are accustomed to using electricity freely; the average domestic consumption is 806 kw.-hr. per year. As a result of its long history of maintenance of list prices in its own merchandising and of co-operation with other sellers of electric appliances, the Commonwealth Edison Company will undertake range promotion assured of trade support.

There is another side to this picture that also calls for comment, namely, the wiring for these range installations. Chicago is pretty much a closed shop town and for years conduit wiring has prevailed for new work. Nevertheless, a high degree of co-operation has existed among the utility, the contractors, the union and the municipal inspection department to the end that less expensive wiring methods could be used under certain conditions for extensions, remodeling and additional outlet work. This co-operation, which has been mutually advantageous to all interests involved, is now extended to range wiring.

Permission for a limited number of range installations using non-metallic sheathed cable has been given by the city inspection department. Inasmuch as the Edison company is thus creating a new market for wiring and labor, there is little likelihood of any opposition arising to an extension of this permission as the number of range installations increases.

By thus securing, at the outset, the support and good will of all who are interested in range installations, from the dealers down to labor, the Commonwealth Edison range program gets off to an auspicious start. It is the kind of a program that should produce the best results.

•

Information on Adequate Farm Wiring Needed

IF RURAL LINES are to pay out, even at the low cost of present practice, the farmer must use much more energy than his city brother. He cannot use the greater service, however, unless he has adequate wiring. This means, essentially, enough copper so that the drop will not be too great for satisfactory operation of the farm electrical equipment. It means adequate wiring for the farm, not just the house.

The several interests that are promoting rural electrification are beginning to realize that without adequate wiring the farmer cannot realize the benefits and economies that have been promised him from electrical service. Isn't it about time that the electrical industry had ready some method for designing adequate farm wiring and then some plan for getting the story of adequate wiring to the farmer? It is, of course, true that some material is available, but nothing like a standard concurred in by all interested groups.

Perhaps one reason why the industry has procrastinated in this job is because our wiring design

authorities do not know farms as well as they know houses, stores and urban buildings. If that is the case, maybe some agricultural engineers could be taught adequate wiring and then produce a plan for interpreting it to farmers.

•

Paper, Pulp, Poles and Preservation

IN THE past two years ten new pulp-and-paper mills have been built or announced in the South, to cost approximately $60,000,000. These mills will add 750,000 tons to the 1,600,000 tons annual capacity of pulp mills already in this region. The importance of this development as a contribution to national self-sufficiency is indicated by the fact that, in 1936, the United States imported more than $222,000,000 worth of paper and paper-making materials, including 1,250,000 cords of pulpwood and 2,250,000 tons of wood pulp. This expansion of an important industry is also significant because of its demands on the timber supply that other wood-using industries in the South, including pole users and creosoters, have more or less complacently thought of as being their own.

Captain I. F. Eldredge, Regional Survey Director of the Southern Forest Experiment Station at New Orleans, is authority for the announcement that in the portion of the lower South neighboring the Gulf Coast and the southeastern seaboard there are 263,000,000 pine trees suited for poles 20 feet or longer. Of the 20-foot sizes, there are 120,000,000; of the 25-foot sizes, 62,000,000; of the 30-foot, 43,000,000; 19,000,000 of the 35-foot, and so on down to 3,000,000 of 50 feet or longer. There are, of course, even larger numbers of the smaller sizes so extensively used by telephone companies for rural lines.

It has long been the common practice of sawmills, pulp mills, naval stores operators and other forest industries to utilize trees having pole qualifications, without regard to their higher value as poles. Lumber operations take the larger and taller trees, while the activities of pulp mills are directed toward the smaller ones and toward the young trees that constitute the future supply of pole timber. The 22 sulphate pulp mills operating in the South in 1936 are using approximately 2,000,000 cords of pine pulpwood per annum. About one-fourth of this, or 500,000 cords, comes from trees that are now, or would grow into, usable pole timber. This is equivalent to about 5,000,000 poles, of which perhaps 3,750,000 are taken annually from the area covered by Captain Eldredge's estimate. By the end of 1938 the number of mills using pine promises to increase to perhaps 35.

This expansion of the pulp industry, it is obvious, will have an effect on the future timber supply of the other wood-using industries in the South. While there may be enough forest land and enough growing timber in the South to furnish a continuous supply of raw material for the pole, the lumber, the naval stores industries, and for an expanded pulp and paper industry, this is only true if this land and its growing stock of trees are handled with skill and intelligence. Lumbermen and naval stores operators, who have always owned more or less timberland, can meet the situation by increasing their timberland holdings and growing their own future supply. Wood preservers, on the other hand, have never considered it practicable to own timberland or to raise their own poles and other products; they have depended upon many landowners, large and small, to grow poles for them. In order to hold their own in the face of this growing competition for timber in an important pole-producing territory, it is obviously to their interest to work toward better forest management on the other man's land. This can be done by getting behind those forestry agencies, both public and private, whose purpose it is to induce timber owners to grow more and better timber and to aid them in doing it.

A supplementary line of approach and a desirable one is for large pole users and creosoters to mold their practices constantly in the direction of creating a steady demand for a standardized product. Specifications for poles should be set up that will be more in harmony with the wood's run of lengths and diameters than is now the case. Much can be done to standardize on roofing and framing practices so as to make the stored-for-seasoning poles more universally adaptable to the needs of the patrons of the preserving yards. Still more can be done toward anticipating the long range trend, if power utilities will do their purchasing and storing on a much less spasmodic basis than at present.

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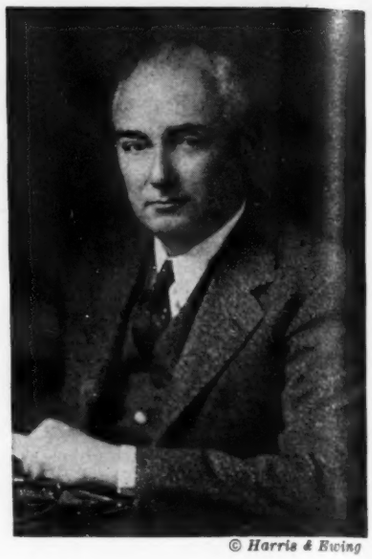
Private Enterprise in Public Service

EVEN though to advertise it here may result in requests for copies from a wider field of interest than was contemplated, still we cannot refrain from commendatory mention of the March 15 issue of the *O-K News*, employee organ of the Cincinnati Gas & Electric Company. This particular issue presents a rotogravure picture story of the Ohio River flood as it affected the Cincinnati utilities. Southern Indiana Gas & Electric Company did a similarly meritorious job in portraying what the flood did to Evansville.

In such a graphic presentation of utility performance in a time of grave emergency lies the whole story of the devotion and efficiency of private enterprise in the public service. No one can say, after looking at the pictures in this unassuming employee publication, that private enterprise in the utility field cannot be depended on for complete and effective dedication to the public good of all its human and inanimate resources. This is the story American business has to tell to the American people.

Norris Seeks a TVA for Every Stream

By CARTER FIELD



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This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location in Washington make his thoughts informative and interesting even though all may not agree with him.

TVA DAMS all over the country was the confident prediction of Senator George W. Norris of Nebraska as he left the White House after a recent conference with the President. A few days later the Nebraska solon gloried in the fact that twenty years earlier he had been among a handful of senators who voted against the United States entering the World War.

One of the large national polls recently indicated that 70 per cent of the people of this country now think that Norris was right—that the U. S. should not have entered the World War. All of which would seem to prove that Senator Norris is a pretty good prophet, and give pause to those who wonder about his plan to put these little TVAs around every damsite on every brook throughout the land.

It might be well to analyze this interesting national character a bit before jumping to any conclusions. There were those back in 1917 who pointed to the fact that nearly one-third of the Nebraska electorate were German as the real explanation for Norris' opposition first to arming American ships, while this country was still neutral, then to the war declaration, and finally to the draft.

But the fact is that Norris had openly and frequently expressed a loathing for the German military machine. It was founded, curiously enough, on one of the few international interests of the Senator. He has always been fond of China, for some reason, and he was shocked at the behavior of the German troops in the Boxer rebellion. In fact, he denounced it early and late as typical of the German troops during the early days of the Belgium invasion.

So that the strong probability is that whatever President Roosevelt may have thought when he was encouraging Norris, the other day, about a nation dotted with a lot of little TVAs, the Nebraska senator never intended to vote against the Supreme enlargement anyhow. He has spoken his piece—declared that the court packing would not alone accomplish the President's objectives — tl.at a constitutional amendment was essential. It just happened that this frank statement, with which so many lawyers agree—Norris used to be a judge himself—was rather devastating to the arguments then being made for the President's proposal. The President couldn't stand having so many liberal senators opposing his "progressive" move. Senator Burton K. Wheeler had proved adamant to the most flattering proposals. So what would be more natural than for the President to lay out the promised land in front of Norris?

But getting back to this prophecy business, Norris may have been a fortune teller about public sentiment on the war, but he was certainly *not* on flood control. During that very period, and in the few years preceding, it is alleged, he had been importuned time and again to help put over a nation-wide system of flood control.

Senator Francis G. Newlands of Nevada was the would-be persuader. He had a scheme which would provide flood control in all sections of the country. He never got to first base because he could not interest the group generally regarded as the economy bloc, of whom Norris was one. Incidentally, the real thing which beat Newlands, and which, could he have got around, would probably have put this country two decades ahead at least on flood control, was his frankness in estimating the cost.

The interest of Senator Norris in flood control, then and now, is mostly academic, since it is the electric angle which interests him most. He wept about cheap fertilizer for the farmers when he was first pushing Muscle Shoals, but they evidently were crocodile tears, since he had said many times before that the soil of Nebraska was so deep it did not need fertilizer.

Now he puts flood control first, as the reason for these additional TVAs. But he would probably vote for the bill with a good deal more enthusiasm if the sole object were the production of cheap electricity. Norris believes in government ownership of the electric industry. He was for it when he opposed letting Henry Ford have Muscle Shoals. He was for it when he bolted in 1928 to Alfred E. Smith and approved Smith's water-power ideas. It was the anti-utility policy of Franklin Roosevelt as Governor of New York which attracted Norris and made him bolt the Republican nominee again in 1932. And it is opposition to privately owned electric interests, not flood control, which attracts the Senator today in the proposed speckling of the landscapes with government - owned - and - operated electric plants.

Norris is scrupulously honest—in deeds. For years, though the poorest member of the Senate—he declined repeated suggestions to put his daughters on the payroll, at a time when the problem of providing them an education strained his senatorial pay. But if he could fool the country into giving it what he regards as the boon of government ownership he would not hesitate to smuggle a wooden horse inside the walls by any compunctions about the strict truth as to flood control!

News OF THE WEEK

Governor Earle Signs "Ripper" Act Establishing New Utilities Board

Pennsylvania's Republican Public Service Commission swept out of office as Legislature passes new regulatory measure — Utilities to pay cost of maintaining commission — Three appointees named

Pennsylvania's Republican Public Service Commission was "ripped" out of office last week when Governor Earle signed the bill abolishing the old commission and setting up a new one. Many drastic changes were made in the old law to carry out the proposals made by the Governor to the General Assembly this year.

The measure regulating the new five-man commission would provide that utilities must prove their rates are fair and service adequate in any complaint case. The old law placed the burden of proof on complainants.

Temporary rates

The commission may set up temporary rates during investigations. If these rates fixed by the commission are found to be unfair to a utility, the company may spread that loss over a fair period, after the case has been settled. Under the old law the then rates would continue in force until the case was decided.

A sliding scale of rates on the basis of automatic continuous adjustment of rates in favor of the consumer when the company's earnings are increasing is provided. The old law left it to the utility to pass on to consumers any increased earnings.

The new law provides that the utilities pay the cost, through assessments, of maintaining the commission and enforcing its regulations. Expenses of investigating complaints against a utility would be paid by that company.

Deposit fees to insure future payments of consumers would be subject to approval of the commission. At present deposits are held at 6 per cent interest by the companies during service, though complaints can be taken to the commission.

Supervision over loans

The commission will have supervision over all loans by holding companies to affiliates. There was no such provision in the old law for transactions of this kind which were for less than one year duration.

Before the old commission ceased to function it fined the Pennsylvania Power & Light Company $63,850 for failing to file a power contract. The commission stated that the company failed to submit a power contract with the Lehigh Valley Transit Company of Allentown, as ordered in 1933. The fine was imposed on the basis of $50 for each day's violation since September, 1933.

Pennsylvania was left without a commission last week when the Senate, lacking a quorum because many members had gone home Wednesday night, failed to act on the three Governor Earle appointees to the new commission. This situation was unprecedented in 25 years of utility regulation.

The three appointees included Dennis J. Driscoll, who is credited with exposing the "fake" telegram lobby against the Wheeler-Rayburn utility holding company bill at the last Congress, as chairman. Mr. Driscoll was defeated for re-election to Congress.

Thomas C. Buchanan, only Democratic member on the outgoing seven-man commission. He was appointed to the old body by Governor Earle. Mr. Buchanan previously served in the Earle Cabinet as Secretary of Forests and Waters.

Richard J. Beamish, counsel for the commission and a champion of low consumer rates. He did much in shaping the Earle utility regulation. Mr. Beamish was Secretary of the Commonwealth during the Pinchot Administration, but shifted parties to support Governor Earle during the last campaign.

•

Pennsylvania Rural Units Bill Proposed

A bill to permit the organization of non-profit co-operative corporations to advance rural electrification was introduced in the Pennsylvania Senate by Senator J. Albert Reed, chairman of the Senate utilities committee. It is part of Gov. George H. Earle's utility program.

The measure authorizes co-operatives to be formed to furnish electrical energy to persons in rural areas who are not receiving central service from stations, assist in the wiring of premises or the acquisition, supply or installation of electrical or plumbing equipment and furnish electrical energy, wiring facilities, electrical or plumbing equipment or services to other firms organized under the act.

Co-operatives are to be placed under the jurisdiction of the Public Utility Commission. Co-operative corporations would be permitted to generate and manufacture electric energy and furnish it to member consumers, assisting them in wiring their premises. They could exercise the power of eminent domain, acquiring private prop-

erty for public use, sell and convey land, borrow money and fix and collect fees. Any three or more persons could act as incorporators and all corporations set up under provisions of the act would be known as "Electric Co-operatives."

•

Utilities Oppose Appliance Measure

Prohibition of gas or electric appliance sales by public utilities came before the judiciary committee of the Connecticut Legislature last Wednesday when Senate Bill 1068 was aired before an audience which filled the great hall of the House of Representatives to overflowing.

Charles Delia, representing the Connecticut Appliance Association, advocated passage of the bill on the ground that in Fairfield and New Haven counties acute competition between the New Haven Gas Light and United Illuminating companies had led to price cutting and terms of three to four years on appliance payments without adequate carrying charges, which, the speaker said, made it impossible for dealers to survive.

Mr. Delia stated that the Hartford Electric Light Company's non-merchandising policy combined with vigorous appliance promotion has been a "wonderful help to dealers." The Connecticut Light and Power and Connecticut Power companies came off unscathed in the attack, which centered upon the utilities in the New Haven-Bridgeport area.

The bill was opposed on principle by Austin D. Barney, for the Hartford and Connecticut Power companies, and by F. W. Cole of the Hartford Gas Light Company, the latter speaker citing the inconvenience to the public a merchandising prohibition bill entails. Edward M. Day, for the Connecticut Light & Power Company, vigorously opposed the bill on the following grounds:

1. Public utilities have a duty to the communities served to promote widespread use of gas and electricity and so to bring about lower rates.

2. The sale of appliances during the promotional period is a public utility function and service.

3. Fair trade practices are promoted by proper utility sales policies. The correction of evils should be a matter of negotiation rather than of death sentence legislation.

Utility Leaders to Discuss Major Industry Problems at E.E.I. Meet

Interesting program being prepared for annual convention to be held June 1-4 in Chicago — Sales topics and load-building programs to be discussed — Dr. Philip Thomas to give demonstration

A most interesting program is being prepared for the fifth annual convention of the Edison Electric Institute to be held June 1-4 in Chicago. Five business sessions will be held during the four-day meeting, at which many of the major problems affecting the electric utility industry will be discussed by outstanding leaders in the different fields of operation.

For Chicago and the hundreds of attending delegates the convention will be a repeat engagement, as the first E.E.I. national meeting was held there in 1933. The first national convention of the National Electric Light Association, predecessor of E.E.I., was also held in Chicago in 1885.

Sales topics

The first session will be devoted to sales topics dealing primarily with load-building programs, including sales promotion, kitchen planning, lighting and air conditioning. General discussions will be held on each subject.

Philip Sporn of American Gas & Electric will discuss the broad problems of interconnections at the Wednesday meeting. On the same day R. C. Muir, vice-president in charge of engineering of General Electric, will discuss new mechanical and electrical developments and their effect on the production, distribution and use of electricity.

N. G. Symonds, vice-president in charge of sales of Westinghouse Electric & Manufacturing Company, will discuss the manufacturer's stake in the utility industry. This subject will also be discussed by utility executives.

A demonstration of new developments now in the laboratory stage concerning utilization appliances and other electrical equipment by Dr. Philip Thomas of Westinghouse Electric & Manufacturing Company will be of major interest to delegates.

Accident prevention

Accident prevention will be discussed by William E. Mitchell, vice-president and general manager of Georgia Power Company. R. E. Fisher, vice-president of Pacific Gas & Electric, will discuss appliance servicing costs. Dean John T. Madden of New York University will present a study of the public utility industry. An address will be made by T. E. Wilson, vice-president in charge of sales of General Electric Company.

D. E. Karn, vice-president of Consumers Power Company, will make a report on the status of rural electrification. An address is also scheduled by W. C. Mullendore, vice-president of Southern California Edison, and by Prof. Gus Dyer of Vanderbilt University.

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Seeks Intervention of Attorney-General

Efforts of Secretary Ickes to force San Francisco to go into the municipal power business against the will of the voters have been met by a request of the city that Mr. Ickes refer the matter to the Attorney-General and that appropriate action be taken in court to determine whether provisions of the Raker act are being violated.

San Francisco now receives approximately $2,000,000 a year in revenue from the sale of Hetch Hetchy power to Pacific Gas & Electric Company. The sale of power is made through an agreement which, the city claims, is within the provisions of the act.

Recently San Francisco voters turned down the proposal to issue $50,000,000 of revenue bonds to provide distribution facilities for Hetch Hetchy power. The Raker act granted the city the right to construct its water supply and power project on federal lands in Yosemite National Park and the Stanislaus National Forest.

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Authorize REA Borrowing

The Tidewater Electric Company, Virginia East Coast Utilities and the East Coast Public Service Company have been authorized by the Virginia Corporation Commission to borrow $125,000 from the REA.

Committee Appointed to Study Power Sales Advertising Needs

Representatives of utilities approve resolution at meeting in Chicago sponsored by Great Lakes Power Club — Romig names twenty-five to act as group to outline program — Agency recommends plan

More than ninety representatives of utilities in thirty states approved by acclamation at a meeting in Chicago last week a resolution stating the need for national power sales advertising and taking the first step toward getting the project started. The meeting, called and sponsored by the Great Lakes Power Club, profited by stay-over attendance from the Edison Electric Institute sales committee meetings of the three previous days.

R. D. Hayes, chairman of the Power Club advertising committee, called upon W. H. Stueve, in like position in the Petroleum Electric Power Club, who recited the history of the advertising program of that group as proof that a co-operative campaign is entirely practical.

H. G. Hall of Klau-Van Pietersom-Dunlap Associates showed an elaborate and convincing presentation, prepared by his agency, of the competition facing purchased power and the methods that should be used against it in national advertising. The presentation was concerned mostly with Diesel competition. The presentation included a number of copy suggestions as samples of how the utilities might state the merits of their service.

The agency recommended that the advertising program, if undertaken, should be planned for three years, using pages in business and trade papers and in some general circulation magazines—double-page spreads at first. The cost of such a program, assuming participation of 60 per cent of the industry, would be $250,000, $300,000 and $400,000 respectively for the three years. The cost would be assessed on contributing utilities on a basis of 0.4 mill per dollar of revenue remaining after residential and rural revenue had been subtracted from total income.

Committee appointed

After the presentation, W. S. Baugh, Kansas Gas & Electric Company, offered a resolution stating that national power sales advertising should be undertaken and empowering the chairman to appoint a committee from the meeting to work on the project.

D. M. DeBard, chairman of the E.E.I. sales committee, emphasized that while the power salesmen were evidently strong for the project, there still remained a lot of selling to be done to get top utility executives to see the need for it. This was the general conclusion to be taken from the meeting.

Acting on the resolution, P. W. Romig, chairman of the Great Lakes Power Club, who presided, read a list of about 25 names of men present, asking them to serve on the committee.

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Philadelphia Short Circuit Darkens City

Short circuit in a 66,000-volt transmission line at the Plymouth Meeting substation of the Philadelphia Electric Company plunged into darkness the city of Philadelphia and its suburbs, South Jersey from Trenton and Camden to the shore resorts and Wilmington, Del., this week. Failure of an oil switch caused the automatic opening of an oil circuit breaker, which in turn resulted in the interruption of the supply of power from the hydro-generating plant at Conowingo, Md.

Although transportation, including some electrified trains of the Pennsylvania Railroad, was halted, service had been restored to Philadelphia within eight minutes after the outage occurred, and within fifteen minutes, at 3:45 a.m., it was again normal in the remainder of the affected region.

A company statement issued following the outage said: "This is the first instance in the history of the company that an oil breaker of this voltage has failed to function properly in automatically isolating a fault on the equipment with which it is associated."

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Newark Power Failure

Electrical service was restored to a suddenly darkened Newark, N. J., within sixteen minutes after a power failure due to a short circuit on the busbars at the City Dock substation of the Public Service Electric & Gas Company on April 5. The interruption occurred at 11:28, at the height of the after-theater rush.

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New School of Technology

The William R. Moore School of Technology will be erected in Memphis, Tenn., before the end of 1937, W. R. King, president of the board of directors of the William R. Moore Scholastic Foundation, has announced. The school will be built at a cost of approximately $200,000.

LAMP FOR THE PRESIDENT—G. Bertram Regar, president of the Illuminating Engineering Society, presenting the two-millionth I.E.S. lamp to Marvin H. McIntyre, secretary to President Roosevelt, at the White House last week for the President

High Court Refuses Georgia Power Stay

The application of the Georgia Power Company to stay the order of Judge Underwood which forbade the company, in so far as Georgia is concerned, to enforce the injunction granted by Federal Judge Gore in Tennessee enjoining the TVA from expanding its power activities was denied by the Supreme Court last week.

First Judge Gore granted nineteen utilities an injunction to halt TVA power expansion in their territories. Later a ruling by Judge Underwood paved the way for TVA to continue its activities in Georgia. The District Court of Appeals upheld this ruling. Appeal was taken to Justice Cardozo by Georgia Power and referred by him to the full bench for action. The court denied application for a stay.

Last week the TVA filed a similar action in Birmingham seeking to have the Gore injunction declared ineffective in Alabama because of a previous decision upholding the right of TVA to sell power in that state by Judge David J. Davis. The TVA ancillary suit seeks to prevent the Alabama Power Company from relitigating issues which have already been passed upon by the court in the suit brought against the TVA by preferred-stock holders of the utility, it was said by J. L. Fly, TVA general counsel.

The TVA is seeking to have the suit brought by the nineteen utilities dismissed. Hearing has been set for April 16 by the Circuit Court of Appeals at Covington, Ky.

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Hydro Power Export Ban Lifted in Maine

Maine's long ban against exporting hydro-electric energy cannot prevail in the case of the Swans Falls 800-kw. station on the Saco River near Fryeburg, as the Swans Falls Electric Company possesses export rights antedating the famous Fernald law passed many years ago in the mistaken idea that industries would rush into the Pine Tree State en masse if her rivers were electrified for local consumption only.

The Public Service Company of New Hampshire has just acquired the Swans Falls plant with the approval of the Securities and Exchange Commission and will build a 33-kv. transmission line 8.6 miles long to provide improved service to the Conway district, at present dependent on a line 70 miles long from the Ayers Island station near Bristol. Both companies are controlled by the New England Public Service Company of Augusta, Me., and under the new arrangement the New Hampshire utility will pay the parent company $10,000 a year to cover operating expenses and depreciation at Swans Falls, also investing $40,300 in the new transmission link.

The S.E.C.'s consent was made conditional upon the approval of the New Hampshire Public Service Commission in recognition of the importance of local regulative authority in the picture.

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Commission Serves Price-Fixing Order

The Federal Trade Commission served this week upon General Electric Company, Westinghouse Electric & Manufacturing Company, Elliott Company and Allis-Chalmers Manufacturing Company an order to cease and desist from entering into or maintaining any conspiracy to fix and maintain uniform delivered prices in the sale of turbine generators and from selling turbine generators by agreement upon uniform performance guarantees. The order directs the respondents to cease and desist from engaging in the following acts in furtherance of any such conspiracy:

Selling turbine generators upon uniform performance guarantees where the guarantees are not based upon actual performance; from using the pricing sheets of any of the companies as the pricing sheets of any of the others; from submitting uniform bids.

The order, however, does not prohibit the exchange of scientific information, if not used for unlawful price fixing. It was predicated upon a complaint of the commission charging a price-fixing conspiracy in the sale of turbine generators, the purchasers of which are chiefly the federal government, state governments, municipal governments and public utilities, and upon the answers of the companies admitting, for the purposes of the proceeding only, the said conspiracy and the commission's finding that the conspiracy had been entered into.

In the same proceeding, the commission further ordered Westinghouse, Allis-Chalmers, Elliott Company, Worthington Pump & Machinery Corporation, Foster-Wheeler Corporation, C. H. Wheeler Manufacturing Company, Ingersoll-Rand Company and Ross Heater & Manufacturing Company to cease and desist from carrying out and entering into a similar conspiracy with respect to the sale of condensers.

The companies are given 60 days to file a report in writing, stating in detail the manner in which the order has been complied with.

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New Units Planned by Canadian Utility

A second 47,000-hp. turbine and generator is to be installed by the British Columbia Electric Railway Company at its Ruskin power plant. W. G. Murrin, president, stated that work will begin by the middle of April and will be completed by October 1, 1938. The total expenditure will be approximately $1,500,000.

The Dominion Engineering Works will install the turbine and the 19-foot butterfly valve. Canadian Westinghouse Company will build and install the generator, exciter and regulating equipment.

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Joseph F. Becker Honored by Leaders of Industry

Leaders of the electrical industry gathered last week at the Hotel Astor for a testimonial luncheon in honor of Joseph F. Becker, retiring vice-president of the Consolidated Edison Company, Inc., and of the Electrical Association of New York, Inc. For the past five years Mr. Becker has been vice-president of the association and is to be succeeded by E. F. Jeffe.

Floyd L. Carlisle, chairman, and Frank W. Smith, former president, of Consolidated Edison; A. Lincoln Bush and Harry H. Barnes, Jr., were among the principal speakers at the luncheon to honor Mr. Becker. About six hundred attended.

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New York World's Fair

Novel effects are planned for the New York World's Fair of 1939 through the use of high-intensity mercury-vapor lamps and luminous products. It is expected that the light display will be a major feature of the exposition.

Bay State Farm Line Project Is Proposed

Plans of the Tri-County Electric Company, a co-operative formed by western Massachusetts farming interests with REA support, to build 212 miles of rural service lines in a great circle around the upper Connecticut Valley and in the Berkshire area were discussed before the state department of Public Utilities this week at Boston. The board has been petitioned for authority to issue $25,000 par stock and to borrow $255,000 from the federal government on a 20-year mortgage note at 2.77 per cent.

Grafton L. Wilson, attorney for the company, pointed out that the lines are designed not to compete with existing utilities, but are to reach an average of about three customers per mile in remote areas beyond the economic radius of already established power service. All energy to be distributed will be purchased from companies now in business. Bids have been received for construction on the minimum unit basis of approximately $1,020 per mile, including transformers and services to farms, but no action will be taken until the commission decides the petition.

John C. Davis, manager of the company, stated that enough pole and right-of-way locations have been assured to warrant starting initial construction in Deerfield, Heath, Rowe and Orange. It is planned to operate the system in twelve sections, each supplied with energy from an adjacent utility system. Surveys indicate that about 600 customers can be had who will purchase service at a total monthly price of about $3,062. Louis T. Klauber, Philadelphia, consulting engineer for the REA on the project, declared that it offers an unusual opportunity for bulk energy sales to existing systems. Mr. Klauber said that as far as he knew, from connection with a dozen REA projects aggregating 4,000 miles of line and $4,000,000 investment, not a single instance has occurred in the eastern part of the country where private utilities have not been asked to furnish all the energy distributed.

•

New Jersey Utility Plans New High Tension Line

Public Service Corporation of New Jersey plans to prevent a recurrence of the Newark costly five-hour power failure last December by the construction of a $1,000,000 emergency high-tension line to connect Newark with Metuchen and the power house at Kearney.

Public Service Electric & Gas Company plans to run an underground line into Elizabeth to connect with a proposed new substation.

NIGHT WORK—Under a bevy of powerful floodlights construction work on the Paris International Exposition is carried on at night. The exposition, which opens in May, will feature immense exhibits of a scientific and engineering naturo

Standard Group Cuts Boards of Directors

The board of directors of Standard Power & Light Corporation has been reduced from fifteen to five, the class A directors having been diminished from eight to three and the class B from seven to two. Arthur C. Allyn, E. Carleton Granbery, W. C. Langley, Thomas A. O'Hara and Duncan R. Linsley have resigned as class A directors and B. F. Braheney, A. S. Cummins, H. C. Cummins and Charles Keller have resigned as class B directors (there having been previously one vacancy in each class). The class A directors now are Victor Emanuel, Louis H. Seagrave, and F. G. Badenhausen and the class B directors are B. W. Lynch and M. A. Morrison.

Standard Gas & Electric Company has been authorized by the District Court of the United States for the District of Delaware to reduce its number of directors from twelve to seven, according to Bernard W. Lynch, president. Concurrently with the reduction of the board the following persons resigned as directors: A. C. Allyn, Victor Emanuel, E. Carleton Granbery, William C. Langley and Duncan R. Linsley. The remaining members are B. F. Braheney, A. S. Cummins, H. C. Cummins, Charles Keller, Bernard W. Lynch, M. A. Morrison and Louis H. Seagrave.

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Southern Colorado Power Installs Light Standards

Eight blocks on Santa Fe Avenue in Pueblo, Colo., are now lighted by 49 mercury-incandescent luminaires developed by General Electric engineers. The installation was made by the Southern Colorado Power Company and is the first of its kind in the Rocky Mountains.

In each luminaire a 200-watt incandescent lamp and a 400-watt high-intensity mercury-vapor are mounted and inclosed by a rippled-glass globe. Units are staggered six to a city block and are mounted 19 feet above the pavement on steel standards which are spaced 102 feet apart.

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Benefits Cost $1,156,355

Public Service Corporation of New Jersey expended $1,156,355 for employee benefit plans in 1936. Of this sum, $421,464 was spent for pension payments to retired employees.

Ratification Sought on Illinois Plan

Details of the recapitalization plan for the Illinois Power & Light Corporation (ELECTRICAL WORLD, March 13, page 76) to provide the company with a capital structure which will permit future financing through the medium of capital stock, and enable the company to accomplish a debt-refunding program which could total more than $116,000,000, were announced in a letter from J. D. Mortimer, president, to holders of the company's preferred stocks. The letter also contained notice of a special meeting of stockholders on April 30 to authorize the plan.

An unusual feature of the plan will be that the present preferred-share holders as a class will receive from 61 per cent to a possible 87 per cent of the common stock equity which is now held entirely by the Illinois Traction Company, subsidiary of North American Light & Power Company.

According to the letter, consummation of the plan will provide for the payment of arrearages on present $6 and 6 per cent cumulative preferred stocks.

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Dallas Orders Rate Hearing

Public hearings to determine whether reduced rates should be ordered on electric, gas and telephone service in Dallas, Tex., will begin on August 4. City Council set this date after rejecting petitions of the Utility Rate Reduction League which called for a referendum on a proposed ordinance to achieve the same end. At the same meeting Councilmen also rejected a request of the league for submission of another ordinance to the people April 6 which asked for enactment of 4 per cent gross receipts taxes against these same companies.

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Rural Applications Denied

Applications of the Northern States Power Company and the Wisconsin Public Service Corporation to construct rural electric lines have been denied by the Wisconsin Public Service Commission on the ground that they would interfere with co-operative programs. Northern States Power was refused permission to serve eleven customers in the town of Arthur, Chippewa County, and Wisconsin Public Service to serve eighteen residents in Oconto County. In the latter case the commission provided, however, that if within the next twelve months the co-operative abandons its plans the commission, without further hearing, can authorize the Wisconsin Public Service Corporation to construct its line.

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New England Power to Have New Offices

Construction has begun on a $2,000,000 office building for the New England Power Association at Dartmouth and Stuart Streets, Boston, to be occupied by next July 1. The project has been promoted by V. C. Bruce Wetmore, treasurer, Wetmore-Savage Electrical Supply Company, Boston, and W. J. McDonald, prominent Hub realtor, under the organization of the Dartmouth Corporation.

The association will occupy 8½ of the 11 floors and basement and there will be five Westinghouse Electric elevators of 2,500 lb. capacity each, acoustically treated ceilings, and on all floors above the first electric outlets will be provided by the Walker "Alsteel Preset" under-floor distribution system. The association now has 546 employees in Boston.

•

New Vacation Plan Adopted

General Electric Company has adopted a new vacation plan for the hourly rated employees. Under the plan, all employees with one year or more continuous service will get a vacation with pay this year. Employees who have ten or more years of continuous service will be granted two weeks vacation with pay, President Gerard Swope announced.

•

Utilities Get Rehearing

Announcement has been made by the Federal Power Commission that the petition for rehearing filed by Metropolitan Edison Company, Northern Pennsylvania Power Company, Pennsylvania Electric Company, Erie Lighting Company, Clarion River Power Company, and Solar Electric Company, under date of Feruary 23, 1937, in the inquiry and investigation instituted against these companies has been granted, and the matters involved in this proceeding assigned for hearing in Washington, D. C., April 14.

Wisconsin Utilities Extend Rural Lines

Wisconsin Power & Light Company during 1936 made plans for 809 miles of new farm electric lines to serve 2,270 customers and connected 284 new customers to existing lines, according to its report to the Wisconsin Public Service Commission. Estimates were that more than half the 2,270 customers were connected during 1936.

Wisconsin Gas & Electric Company, which established a record in Wisconsin for rural electrification last year, in the week ended January 9 connected 68 customers and completed 37.65 miles of line.

Wisconsin-Michigan Power Company, a sister utility, in its southern dvision for the same week connected 24 new farm customers and completed 11.32 miles of line.

With 15,000 square miles of area served by Wisconsin Power & Light Company, more than any other electric utility in the state, the company had 802 separate work orders for rural electric line extensions in 1936. It reported that customers to be connected to lines built averaged 3.16 per mile.

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Leipzig Fair Sets New Record in Attendance

A new record in attendance at the 700-year-old Leipzig Fair has been set, indicating the rapid improvement in general business conditions. A total of 278,000 from seventy-four countries visited the fair, which comprised 8,897 exhibits. There were more than 33,000 exhibitors and buyers from foreign countries, as against 25,000 last year.

Foreign exhibits were doubled over a year ago, with American participation showing 100 per cent increase.

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Rural Electric Exhibit

A dramatized display explaining the scope of the rural electrification program of the federal government has been opened in the New York Museum of Science and Industry. A contrast between the outmoded farmhouse, where electricity is not available, and a modern farm home, with the many conveniences electricity affords, appears in a diorama with a miniature house shown in cross-section. One part of the house is electrified, while the other is not.

Florida Power Line to Serve Farm Area

Completion of the 66,000-volt line, at a cost of $124,000, by Florida Power & Light Company is bringing metropolitan service to eight communities of the farming region around the eastern and southern shores of Lake Okeechobee. This will mean a saving of approximately $8,000 annually to electric service users in the area. The isolated system centering in Pahokee which has been servicing the community is now a part of the interconnected system of Florida Power & Light Company.

Approximately 14 miles of the extension was built through primitive glades and muck land, with more than a mile so swampy that equipment had to be moved by man-power. Workmen frequently killed 6-ft. rattle snakes and often worked in waist-deep water and mud. Poles were set by dynamite because it was impossible to reach the rock substratum by ordinary means.

A reduction in the minimum charge was made from $3 to $2.75. Energy block charges were also reduced. Commercial combination rates provide for a reduction in the energy blocks from 5 cents and 3 cents to 5 cents and 2 cents and a reduction in the demand charge from $4.50 a kilowatt of demand to $3.50.

•

Tide Water Power to Build Rural Lines with REA Loan

Rural line mileage of 47.6 will be built in the coming season by the Tide Water Power Company of Wilmington, N. C., as the result of a supplementary loan of $48,010 just authorized by REA. Work will begin shortly on these lines in southeastern counties of North Carolina. Voltages will range from 2.3 to 11 kv.

The current loan is the second allotment toward a $150,000 program, more than 124 miles having been built as a result of the $98,000 obtained in 1936.

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Boulder Dam Power Sales

Completion of the initial installation of generating equipment at the Boulder Dam power plant has been reported to Secretary of Interior Harold L. Ickes by John C. Page, Commissioner of Reclamation. Four generators, each of 82,500 kva. capacity, have been installed, tested and placed in operation on the line serving Los Angeles.

When fully equipped, the Boulder Dam power plant will contain 15 large units and two smaller units with a total capacity of 1,835,000 hp. Assuming that sufficient water will be available for production of firm power on and after June 1, it is estimated that the returns from the sale of power during this year will exceed the sum of $1,500,000.

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North Carolina Farm Lines Show Increase

A total of 3,381 miles of rural electric lines have been built in North Carolina since July 1, 1935, according to Dudley Bagley, director of the State Rural Electrification Authority. Other lines totaling 544 miles are now under construction and 1,944 miles have been authorized. When the program is completed the lines will serve 32,227 customers. Total cost was given as $6,040,072 by Mr. Bagley.

The report showed that public utilities have built 2,724 miles of rural lines, have 489 miles under construction and have authorized 1,115 miles at a total cost of $4,490,652.

Municipalities have constructed 456 miles, are building 33 miles and have authorized 27 miles at a total cost of $420,473. The REA has constructed 174 miles, is building 22 miles and has authorized 800 miles at a total cost of $1,091,250. The North Carolina REA built 22 miles for $34,697 and other agencies 4 miles for $3,000.

•

Soviet Armenia Plans New Generating Station

The present capacity of electric power stations in Soviet Armenia of 48,500 kw. will be greatly increased with the completion this year of the first section of the Kanakir station. When fully completed it will have a capacity of 113,000 kw. Before the war Soviet Armenia stations had a capacity of only 3,100 kw.

Electricity for both power and lighting is being introduced on the collective farms. Construction is to be undertaken this year of a new station at Gyumush, which is to be the largest in Transcaucasia and will have a total capacity of 260,000 kw.

Arizona Utility Plans Steam Plant Addition

Construction program for Central Arizona Light & Power Company involving expenditures of $815,000 this year is the largest since 1929, according to E. H. Coe, president. The principal item will be a $315,000 addition to the Buckeye steam plant west of Phoenix.

Other items include raising transmission line capacity between Avondale and Buckeye from 44,000 to 66,000 volts, installing a 3,000-kva. substation at Perryville and a 2,000-kva. substation northwest of Phoenix. Approximately $100,000 will be spent for extension and improvement of distribution lines. The Sycamore line connecting with the Arizona Power Company at Perryville will be rebuilt.

Installation of a 12,500-kw. auxiliary machine in the steam plant is expected to be completed by May and raise the installed capacity to 27,500 kw.

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Ohio Utility Plans to Merge Two Units

Approval of the merger of the Columbus Railway, Power & Light Company with its two subsidiaries, the Southern Ohio Electric Company and the Adams County Power & Light Company, will be sought April 17 at a special meeting of stockholders.

Under the proposed plan the new company will be known as Columbus and Southern Electric Company. Stocks of the companies will be exchanged, share for share, for those of the new company. It is said that the merger will result in operating economies.

•

City Plants Win tax Fight

Municipally owned utilities have been released by the Missouri Supreme Court from paying the old one-half of 1 per cent sales tax. The state auditor has continued to collect the levy over protest of city-owned light, power and water utilities since the old sales tax was approved in 1933.

This recent decision came in a case brought by the city of Webster Groves seeking to prohibit the auditor from collecting the tax on sales of the city water department. Other municipalities pushing similar suits have waited for action in the Webster Groves case.

Sheffield Bond Sale to Replace PWA Loan

Purchase of $280,000 of 5 per cent revenue bonds to finance the construction of the Sheffield, Ala., new municipal power system to distribute TVA power has been made by A. L. Hogan of New Orleans. The University Electric Company of New Orleans contracted for the work.

The privately secured money will take the place of a $177,500 loan of 4 per cent and a $52,500 grant which PWA allotted to the city November 23, 1933, but which has been held up by litigation since that time.

It is reported that other municipalities whose PWA allotments for power plants have been delayed by suits may seek the same procedure.

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S.A.E. to Hold Meeting

The Baltimore section of the Society of Automotive Engineers will hold its transportation and maintenance meeting on public utility fleet operation at the Hotel Belvedere, in Baltimore, on April 15 and 16. Among those making addresses at the sessions are J. G. Holtzclaw, Virginia Electric & Power; F. B. Flahive, Columbia Gas & Electric; W. R. Pollard, Georgia Power; O. A. Axelson, Columbia Gas & Electric; E. W. Jahn, Consolidated of Baltimore; J. Y. Ray, Virginia Electric & Power; Daniel Durie, West Penn Power, and C. D. Peebles.

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Kansas City Sales School

The Electric and Radio Association of Kansas City recently conducted a sales school under the direction of Gerald E. Stedman, vice-president of Cramer-Krasselt Company, Milwaukee. Sessions were held for retail and wholesale salesmen as well as for dealers. The meetings were well attended and came at a time when an intensive sales campaign on electric refrigerators was being held. Training applied to all electrical appliances.

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Platte Valley Hearing Set

The Federal Power Commission has announced that reconsideration would be given its finding of January 19, 1937 that the interests of interstate commerce would be affected by the construction of the project works described in the application of the Platte Valley Public Power and Irrigation District, in Nebraska. The Commission has suspended the operation of its finding pending a final determination, and a hearing on the effect of the project upon the interests of interstate commerce will be held in Washington, D. C., May 17.

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Approve Franchise Sale

The Connecticut Legislature has approved a bill authorizing the East Hartford Improvement Company to sell or lease franchises to do an electric light and power business and property involved to the Hartford Electric Light Company. Transfer would be subject to commission and stockholders' approval.

Meetings

Greater New York Safety Council—Annual convention, Astor Hotel, New York, N. Y., April 13-15. Paul W. Garrett, secretary, 60 East 42d St., New York, N. Y.

International Association for Testing Materials—International congress, London, England, April 19-24. K. Headlam-Morley, honorary secretary, 28 Victoria St., London, S.W.1.

Missouri Association of Public Utilities—Annual convention, Elms Hotel, Excelsior Springs, Mo., April 21-23. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

Association of Iron and Steel Engineers—Spring meeting, Buffalo, N. Y., April 28-29. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Electrochemical Society—Spring meeting, Benjamin Franklin Hotel, Philadelphia, Pa., April 28-May 1. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Edison Electric Institute—Annual technical committees, Chicago, May 3-7; annual meeting, Chicago, June 1-4. Bernard F. Weadock, managing director, 420 Lexington Avenue, New York.

American Institute of Electrical Engineers—Northeastern district, Buffalo, N. Y., May 5-7. H. H. Henline, national secretary, 33 West 39th St., New York.

Electric Metering Conference—Deshler Wallick Hotel, Columbus, Ohio, May 11-12. J. N. Schwartz, Columbus Railway, Power & Light Company, Columbus, Ohio.

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 17-21. W. J. Donald, managing director, 155 East 44th Street, New York, N. Y.

National Electrical Wholesalers Association—Annual convention, The Homestead, Hot Springs, Va., May 23-27. Alfred Byers, secretary, National Electrical Wholesalers Association, 165 Broadway, New York, N. Y.

Southeastern Electric Exchange—Fourth annual conference, The Homestead, Hot Springs, Va., May 27-29. J. W. Talley, executive secretary, 308 Haas-Howell Building, Atlanta, Ga.

EHFA to Finance Sale of Appliances

Contracts have been negotiated by the Electric Home and Farm Authority covering the extension of its low-cost appliance financing plan to the customers of the Iowa Electric Light & Power Company and also of the Northern States Power Company and its principal subsidiaries. Companies now included are the Northern States Power Companies of Minnesota and of Wisconsin, the Minneapolis General Electric Company and the Interstate Light and Power Companies of Wisconsin and of Delaware. Other smaller subsidiaries of the system are expected to join in at a later date.

A prominent part was taken in negotiating the new contracts by the North Central Associated Electrical Industries, an organization formed to promote the greater use of electricity in the region. H. E. Young, vice-president of Northern States, is chairman, and A. H. Kessler, Minneapolis, is secretary.

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French Lighting Congress

A congress on lighting is being arranged abroad by a French committee. The congress will be held from June 24 to a date to be set early in July. American lighting men have been invited to attend and to participate in discussions. "The French lighting congress," according to Preston S. Millar, president of the United States National Committee of the International Commission on Illumination, "is to be held in connection with the International Exposition.

The U. S. National Committee of the I.C.I., however, is lending its support and will be glad to serve as a 'clearing house' for American lighting men desiring to present papers. . . ."

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Fair to Dramatize Light

Fluorescent lighting effects are an important part of the plans for dramatizing the generation and utilization of electricity, according to Arthur H. Halloran, chief of electricity and communications exhibits for the Golden Gate International Exposition to be held in San Francisco in 1939. These effects are to be applied to large dioramas and cycloramas and to smaller exhibits designed to contrast good and bad wiring practice.

Output Yields to Springtime Trend

After maintaining an unusually level rate for nine weeks the operations of electric light and power plants have at last responded to seasonal influences, output during the week ended April 3 dropping to 2,146,959,000 kw.-hr. compared with 2,200,143,000 kw.-hr. in the preceding week.

The increase of 15.0 per cent over the like period a year ago is above the average for the past five months although the margin is somewhat smaller than the exceptional figures reported during March. Compared with the December peak the output is down 5.8 per cent, which is a slightly better showing than the decrease of 6.7 per cent a year ago.

The very small increase of production in the Pacific states—only 2 per cent—understates the demand because large quantities of energy are now flowing in from Boulder Dam. Large gains continue in the Mountain, Central Industrial and New England states.

Weekly Output, Millions of Kw.-Hr.

1937	1936	1935
Apr. 3...2,147	Mar. 28..1,867	Mar. 30..1,713
Mar. 27...2,200	Mar. 21..1,862	Mar. 23..1,725
Mar. 20...2,211	Mar. 14..1,901	Mar. 16..1,728
Mar. 13...2,213	Mar. 7..1,893	Mar. 9..1,724
Mar. 6...2,200	Feb. 29..1,903	Mar. 2..1,734
Feb. 27...2,207	Feb. 22..1,942	Feb. 23..1,728

Per Cent Change from Previous Year

Region	Week ended Apr. 3	Mar. 27	Mar. 20
New England.....	+17.4	+18.9	+21.1
Middle Atlantic...	+ 8.7	+13.2	+14.5
Central Industrial.	+16.8	+24.4	+20.0
West Central.....	+ 6.9	+11.4	+ 9.9
Southern States...	+ 7.9	+18.3	+19.0
Rocky Mountain..	+32.7	+31.5	+30.7
Pacific.....	+ 2.0	+ 3.8	+ 4.2
United States...	+15.0	+18.1	+16.3

February Output 8 per Cent Over 1937

Production of energy for public use in February amounted to 8,999,626,000 kw.-hr., according to preliminary statistics announced by the Federal Power Commission. This figure is not comparable, however, with the 8,599,000,000 kw.-hr. reported for the same month of 1936 because energy from electric railway, electrified railroad and miscellaneous federal, state and other plants is now being reported separately. This amounted in February to 279,948,000 kw.-hr. The combined total indicates an increase of 8 per cent. Even with this adjustment the apparent growth is slightly understated; beginning with January manufacturing plants which formerly produced some electricity for public use, but no longer do so, have been eliminated.

The national and regional percentages in the table are therefore only approximate measures of the increase; some regions are affected more than others by the eliminations, but there are no data for estimating the magnitude of the error.

The increase of 32 per cent in the mountain region is due primarily to the output at Boulder Dam, which raised the production in Nevada for public use to 76,580,000 kw.-hr. compared with 4,692,000 kw.-hr. a year ago. The rise of 20 per cent in the West North Central states was due mainly to a large increase in Missouri.

Energy Output, February, 1937

Millions of Kilowatt-Hours

	For Public Use					
	Hydro	Fuel	Total	Rail, etc.	Combined	P. C. Chg.
United States...	3,486	5,514	9,000	280	9,280	+ 8
New England...	307	309	616	33	649	+ 9
Mid. Atlantic..	749	1,542	2,291	170	2,461	+11
E. No. Central.	175	1,973	2,148	32	2,180	+ 8
W. No. Central.	179	439	618	19	637	+20
South Atlantic..	673	409	1,082	18	1,100	+ 3
E. So. Central..	312	82	394	1	395	+ 7
W. So. Central..	26	418	444	0	444	+11
Mountain.....	248	108	356	4	360	+32
Pacific.....	817	234	1,051	3	1,054	— 0

Utility Stock Prices Recede Slightly

Utility stock prices moved slightly lower this week to establish a new low for the year. "Electrical World" index, 35.4; last week, 35.8; year's high, 41.5

Three Niagara Units to Be Consolidated

Niagara Hudson Power Corporation took another step toward the simplification of its corporate structure with the filing of a certificate of consolidation by three of the operating units of the system with the Department of State. The three companies, located on the Niagara frontier, are the Buffalo General Electric Company, Niagara Electric Service Corporation and Tonawanda Power Company. The name of the new consolidated company will be the Buffalo Niagara Electric Corporation.

The capital stock of the new corporation, to be presently issued, comprising 1,097,369 shares, is to be owned by the Buffalo, Niagara & Eastern Power Corporation. The capital of the corporation, it was announced, will not exceed the sum of the capital stock of the constituent corporations. Following the formation of the new corporation, a new schedule of electric rates will be filed which will reduce the cost of service to commercial customers, and changes effecting reductions also will be made in some industrial power classifications.

William Kelly, president of the Buffalo, Niagara & Eastern Power Corporation, announced that at a special meeting the following officers of the new corporation were elected:

Horace L. Mann, president; Norman R. Gibson, Col. William Kelly, Edward D. King, Paulding F. Sellers, Merrill E. Skinner, Herbert M. Sharp vice-presidents; Warren Tubbs, vice-president and counsel; Charles D. Warren, vice-president and secretary; George J. Brett, treasurer; William C. Bingham, assistant secretary and treasurer, and Arthur W. Jackson, assistant treasurer. Directors, N. R. Gibson, William Kelly, Daniel J. Kenefick, E. D. King, H. L. Mann, Alfred H. Schoellkopf, Paul A. Schoellkopf, P. F. Sellers and Warren Tubbs.

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Interest on Winnipeg Bonds

Winnipeg Electric Company, Winnipeg, Man., has made declaration of interest of 4 per cent on its general mortgage "B" income bonds applicable to the entire year 1936. The interest is payable May 3. This announcement indicates a fairly satisfactory start made by the new consolidated company under the plan of capital reorganization which merged this company, Manitoba Power, Northwestern Power and two other smaller subsidiaries.

•

Utility Pleas Filed

Among the recent statements filed by utility companies with the SEC are the following:

Great Lakes Utilities Company, a registered holding company and successor to the bankrupt Great Lakes Utilities Corporation, filed a declaration and amendment covering its assumption of the obligations of the predecessor company and subsidiaries. Under the plan of reorganization the new company will assume the $1,676,500 of collateral trust bonds of the old company now outstanding, and will issue in respect of other securities and debt of the old company 153,034 shares of common stock to voting trustees, who will distribute voting trust certificates representing such shares. The stock will have a par value of $1 a share. In respect to its holdings in the old company, National Public Utilities Corporation will receive, under the plan of reorganiation, voting trust certificates for 149,702 common shares of the new company.

Abington Electric Company of Philadelphia, subsidiary of Republic Service Corporation, a registered holding company, filed an application under the Holding Company Act for exemption of the issue of $590,000 March 8, 1937.

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Rockland Petition Denied

Petition of the Rockland Gas Company, Inc., for consent to transfer all its franchises, works and system to the Rockland Light & Power Company has been denied by the New York Public Service Commission. The application was denied as the result of a determination that the proposed transfer was not in the public interest.

Annual Reports (Utilities)

	1936	1935
American Power & Light & subs.	$10,398,806	$7,512,476
American Water Works & Elec. & subs.	4,749,846	3,494,430
Northern New York Utilities	871,203	636,120
United Gas Improvement & subs.	30,659,290	30,298,882*
West Penn Power & subs.	7,413,958	6,674,728

*Restated for comparative purposes.

New Issues of Electric Light and Power Securities in March

Name of Company	Amount (Par Value)	Offered to	Period	Class	Purpose	Interest Rate	Price	Per Cent Yield
Philadelphia Electric Co.	$130,000,000	Public	30	First and refunding mortgage bonds	To redeem outstanding bonds	3¼	102¼	3.367
Long Island Lighting Co.	2,000,000	Placed privately	23¼	First refunding mortgage bonds, series C	To finance expansion	4	100	4
Total	$132,000,000	.....	.....	.....	.....	.....	.....	.....

What Do You Require of a Demand Meter?

Do you need to know only the peak of the month? Or must you know when the peaks occurred, and have a definite record of the demands? Or do you need more comprehensive information, as for example, totalized demand?

The Answer

You can find the answer to these often-complex problems in the complete G-E line of demand meters. There are indicating and recording forms of demand meters and watthour-demand meters. In addition, there is complete equipment for totalizing demands (including totalization of remotely metered installations) and other associated problems.

Your nearest G-E specialist can suggest a practical solution for any of your metering problems. It will be based on the use of proved equipment which assures satisfaction. Ask him or write General Electric Company, Schenectady, N. Y.

410-68

GENERAL ELECTRIC

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Outdoor Metering Is Economical

In discussing the advantages of outdoor metering before the Municipal Lighting Association of Massachusetts Hector L. Gianascol, superintendent of the meter department, Reading, analyzed the economic gain to be realized by installing 1,000 such meters under conditions prevailing in that place. The required investment was about $6,000, this being the average cost ($6 per meter) of 700 installations at Reading, including materials, meter inclosure, labor and truck expense. The total annual savings computed, broken down as follows, were $790, a saving of $190, or 3.2 per cent, on the foregoing investment:

Time saved on readings	$280
Time saved on skips	75
Time saved on service connections and disconnects	70
Value of deferred income—interest	60
Time saved on meter tests	35
Revenue loss from diversion, now saved	270
Total	$790

The above data were obtained as follows:

The time saved by reading meters outdoors averaged two minutes per meter, based on 117 cases at Reading covering different types of residences and including some delays at the door or by house occupants engaging the reader in conversation. The annual value of such time savings was based on a 70 cents per hour wage. Missed meter readings averaged higher than 10 per cent of the total number read. The elimination of call-backs would save about $75 per year if five minutes is allowed per call-back, with a few dollars added to allow for cards, handling, etc. Income held back yields no interest and also causes the loss of discounts given for prompt payments of invoices. If the average annual revenue per customer is taken conservatively at $30 and the value of the use of the money thus tied up is taken at 4 per cent, the saving on this item would be $60 a year, assuming that half the customers whose readings were formerly missed receive bills on time with outdoor metering and pay them accordingly.

Time saving on connecting and disconnecting services varies widely according to conditions. At Reading between its permanent and transient residents an average condition probably prevails. When allowance is made for time saved in procuring keys or making call-backs it is fair to assume that ten minutes is saved on each job. Outdoor meters would then save about $70 a year if the cut-ins and cut-outs are taken as 36 per month per 1,000 meters, with allowance added for the extra savings obtained by eliminating connections and disconnections on poles. Monthly access to meters also means better surveillance and less uncollectible revenue from customers seeking to depart with unpaid bills, but this cannot readily be estimated.

Tests at Reading showed that unaccounted for energy totaled 0.68 per cent in one street after a year's comparison of secondary outputs of transformers with collective registration of customers' meters, allowing for line losses, meter potential energy loss, and secondary copper losses; 0.82 per cent for 27 customers; 5.7 per cent on another street, and 7 per cent for 28 customers. It is planned to place all meters in the suspected areas outdoors. Mr. Gianascol stated that Reading's experience teaches that it it is only necessary to expose a few offenders who use large quantities of "diverted" energy to pay for the many installations needed to form a dragnet which will catch these few. Facts show that in twenty years the revenue added by the stoppage of theft on six customers caught in and about Reading would total $6,800, or enough to pay for 1,132 outdoor meter changes at $6 each. Some value should be assigned to energy illegitimately used either deliberately or unintentionally. Tempering the data of experience with probabilities permits this loss to be placed conservatively at 1 per cent of the total energy sold to all classes of customers. There are many other advantages in outdoor

Speeds Pole Setting

This new gin pole, developed by Grover Leister of the Pacific Gas & Electric Company, sets 55- and 60-ft. poles at the rate of one every seven minutes. Built from selected wood, treated with linseed oil, the pole is of light construction and can be folded up on the side of the truck, thus increasing its portability. Note distance from pole (55 ft.) to derrick.

NEW

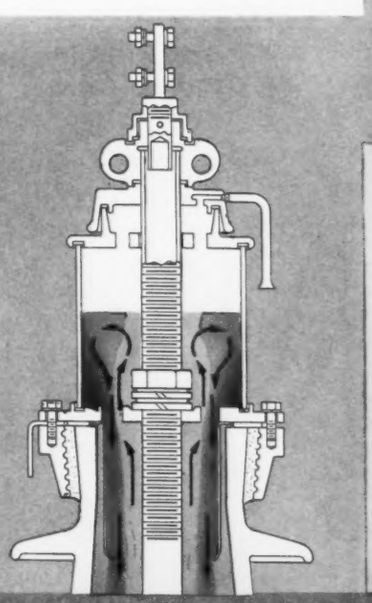
The THERMAL SEAL

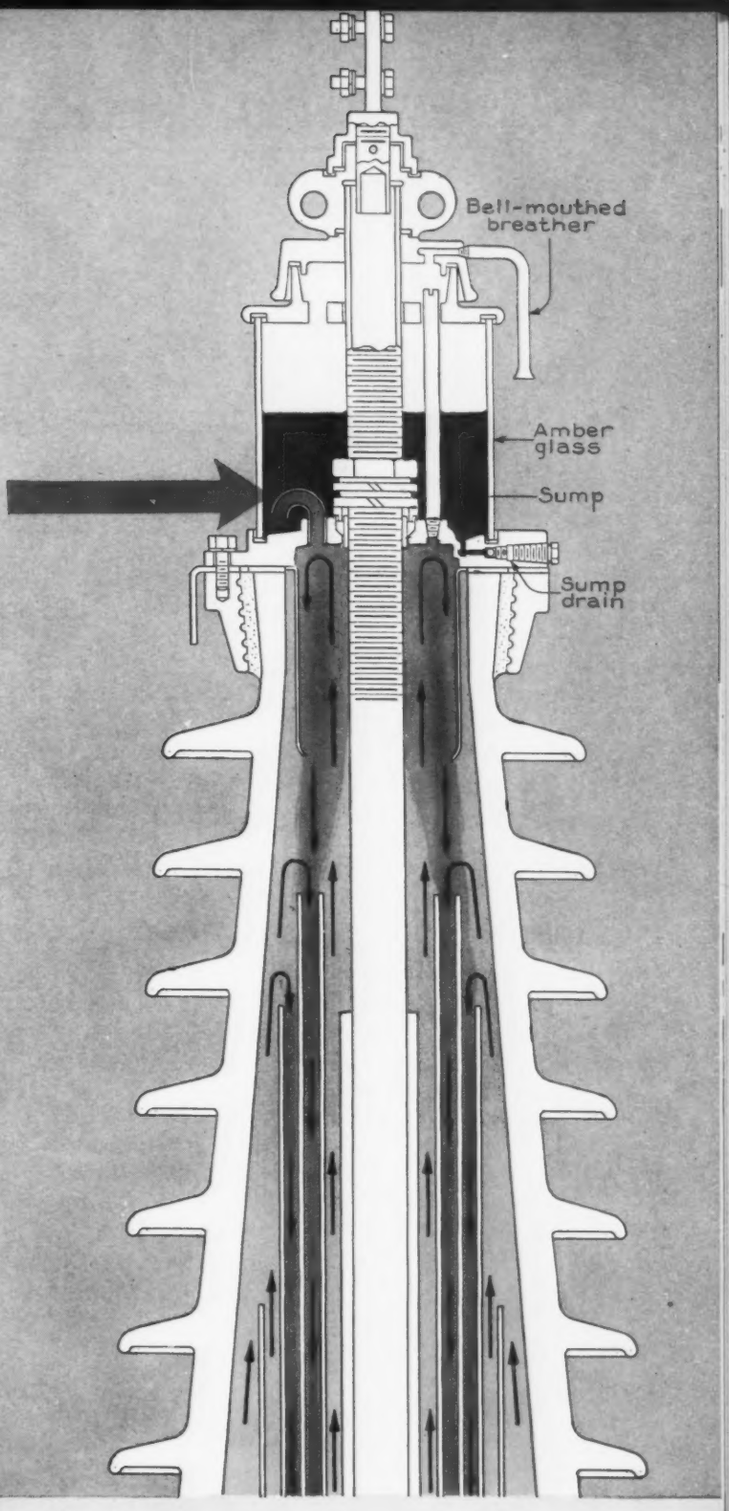
Cuts Bushing Maintenance

THE thermal seal with which G-E oil-filled bushings are equipped is a simple, reliable device based on the well-known thermal principle of the heat trap. It prevents exposure of the bulk of insulating oil to air, eliminating the moisture absorption which such exposure entails. The seal extends the life of the oil and insulation, and maintains the initial low power-factor of the bushing — a positive indication that bushing reliability is improved and thus that service interruptions because of bushing failures can be prevented.

The thermal seal is one of the several features that make the interior of G-E oil-filled bushings independent of weather conditions, and practically eliminates maintenance of bushing interiors.

The thermal seal is designed so that it can be applied at small expense to existing oil-filled bushings. Reconditioned and modernized with this device, existing bushings can be returned to service in a condition comparable to new bushings. General Electric, Schenectady, N. Y.

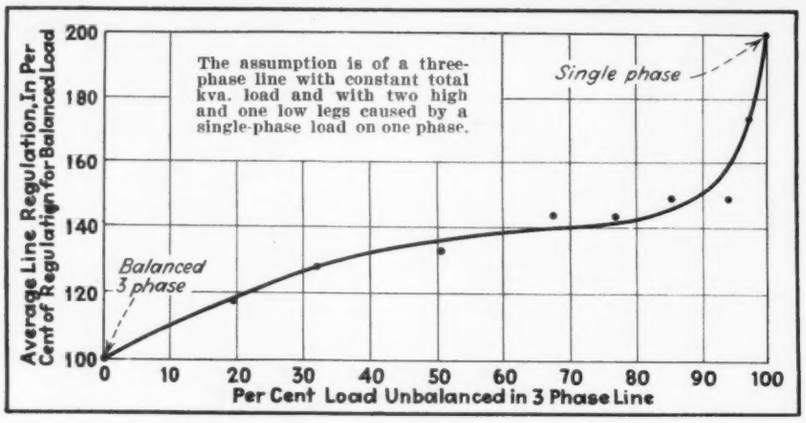




The Thermal Seal. *In these sectional views, the arrows show the natural circulation of oil throughout the internal insulating structure of the bushing, due to differences in temperature. The darker the green, the cooler the oil. Note how, in the absence of the thermal seal, at left, the oil circulates freely from the bushing to the expansion chamber. In the new G-E bushings, above, there is only one opening between bushing and expansion chamber. Connected to the opening is an inverted "U" tube which forms the thermal seal or heat trap, which, while it allows for the very small movement caused by thermal expansion and contraction of the oil, prevents all free circulation between the bushing and expansion chamber.*

310-20

GENERAL ELECTRIC



Effect of load unbalance on regulation

metering well known to the industry, including better layouts of grounding connections, improved transformer protection, accounting (uniformity in clerical work), better public relations.

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Unbalanced Voltages—Their Causes, Effects

By B. E. ELLSWORTH
Engineer Iowa-Nebraska Light & Power Company, Lincoln, Neb.

Unbalanced currents in transmission or distribution lines cause unequal voltage drops in the various line conductors and, as a result, unequal voltages on the different phases of a system. This results in circulating currents, excessive line drops, motor and generator heating and poor voltage conditions in general. Unbalanced voltages may be caused by:

1. Unbalanced line drops due to unbalanced line currents.
2. Open delta transformer banks.
3. Two induction voltage regulators with rotors mechanically tied together.
4. Lines in which all three conductors are not of the same size.

Unbalanced line currents are usually caused by single-phase loads supplied from three-phase lines. The greater this unbalance becomes the closer the regulation of the line approaches that of a single-phase line, which is double the regulation for a three-phase line.

Ordinarily the per cent current or voltage unbalance of a system is equal to the maximum deviation from the average value divided by the average value. As an example, assume the voltages of 120, 118 and 112 are measured on a given line. The average value is 116.7 volts; the maximum deviation from the average is 112 volts; 116.7 minus 112 equals 4.7 volts, which divided by 116.7 gives 4.0 per cent unbalance.

The effect of unbalanced load on the average regulation of a given line is illustrated by the accompanying graph, assuming the kva. load remains constant. It will be noted that excessive line drop is caused by an unbalance of 30 per cent or more. An unbalance with one low and two high phases was assumed, which approximates a three-phase line carrying a large single-phase load. An unbalance where all three line currents are different causes an increase in line regulation over that shown by the graph.

There are a great number of schemes for balancing single-phase loads on a three-phase line. The most simple is to split the lighting load and place it on two of the phases. This usually can be done very easily and a good balance is usually secured. Perhaps the worst voltage combination would be a line serving large single-phase loads through one or two open delta transformer banks and regulated by two regulators mechanically tied together. With such a combination almost any voltage may be expected if the proper combination exists.

•

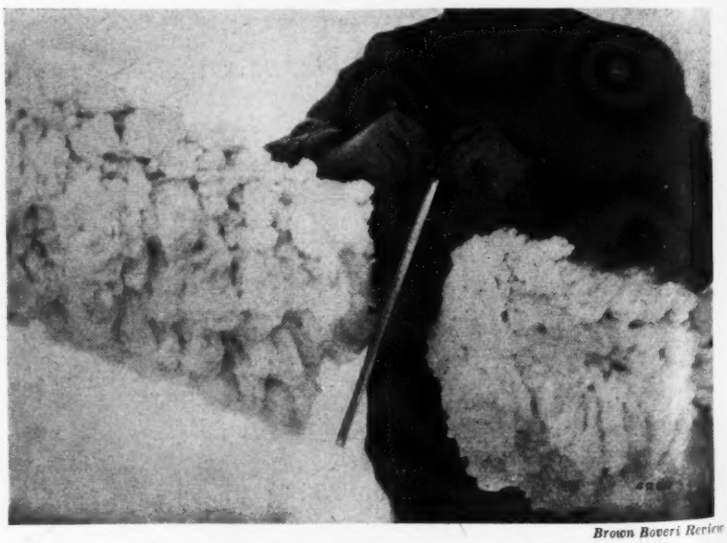
Study Hoar Frost as Line Design Factor

Considerable data of general interest on the formation of hoar frost on power lines has been compiled by the Compagnie Hydroelectrique d'Auvergne, France. The company operates a number of power lines in mountainous country at altitudes of 2,100 to 3,960 ft. In these localities hoar frost and ice formation on lines are much in evidence and lines must be designed with this in view.

In many places diameters of hoar frost of 4½, 5 and even 7 and 9½ in. were attained up until 1933 on the rural lines of this French company, the load exceeding 8 lb./ft. In the winter of 1934-1935 a load of 13.4 lb./ft. was noted (on the Monts de la Margeride) on a low-voltage line built of copper-steel cable 18 mm. section. Diameter of the deposit was 15¾ in.

Hoar frost generally forms when the humidity of the air is high, usually in wooded country, valleys or in the neighborhood of lakes and marshes. Density varies widely. It is often low, 0.2 to 0.3 (density of water = 1.0), but it sometimes attains the density of ice. Densities vary with years and localities. At places where accidents occur the hoar frost is generally compact and hard.

Formerly the assumption generally

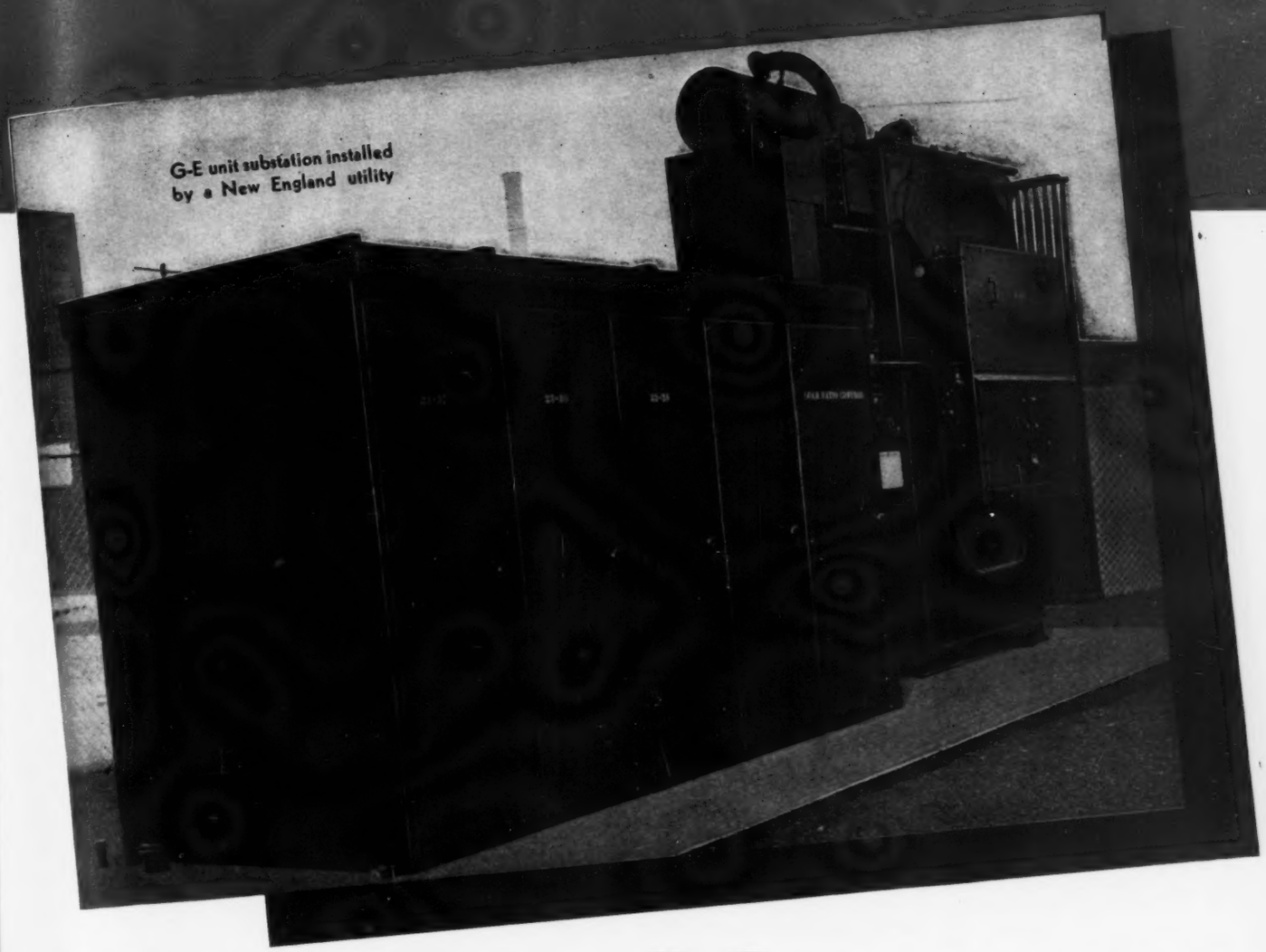


Brown Boveri Review

A hoar frost deposit of 15¾ in. diameter may form on conductors under severe conditions, as in this case

CONSIDER

WHAT THE UNIT SUBSTATION SAVES



G-E unit substation installed by a New England utility

REAL ESTATE—You save in real estate and taxes because the unit substation is compact and self-contained, having small land requirements, and needing no buildings.

SYSTEM INVESTMENT—You save large system investment because capacity can be added in small increments. You save detail station layout costs because unit substations are shipped assembled and can readily be duplicated.

INSTALLATION COSTS—Time required for installation is a matter of hours instead of weeks because you simply set the units in place and connect the cables.

AND IT'S FLEXIBLE—The unit substation can be moved quickly and inexpensively to new locations should a shift in the load center demand a change.

Write to the nearest G-E office or General Electric, Dept. 6A-201, Schenectady, N. Y., for complete information on these attractive unit substations which can be placed where open structures would be undesirable or prohibitive.

310-22

GENERAL ELECTRIC

Speed Tank Lifting With Electric Drill

Five minutes time and considerable labor were formerly required to lift the tank of 13,000-volt feeder oil circuit breakers at the Grand Avenue station before the maintenance department, Kansas City Power & Light Company, changed the tank lifter to accommodate a ½-in electric drill. Tanks are now lifted in one minute

adopted was that hoar frost forms in calm weather at temperatures near freezing. It was also assumed that a wind of 2.04 lb./sq.ft. did not allow hoar frost formation of more than three diameters, while a wind of 8.1 lb./sq.ft. did not allow formations above two diameters. Investigation showed considerable hoar frost formation to be possible under fairly high winds and in very cold weather (+19.4 to −13 deg. F.).

Formation of hoar frost is occasionally quite rapid. It has been noted in the Domes mountains that an ice sleeve of 11.8 in. diameter frequently forms in less than 30 minutes.

A complete report of the investigations of the Cie. Hydroelectrique d'Auvergne is given in the December, 1936, issue of the *Brown Boveri Review*, from which this item is adapted.

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Pole Types Vary with Service Requirements

It is not economical to leave it to the lineman to pick any pole he may happen to find in the yard and use it for any purpose whatever. The Detroit Edison Company uses the following definite instructions for the selection of poles for various purposes:

(A) DEFINITIONS—An *unused* pole is one which has not been used for line or other purposes.

A *used* pole is one which has been used for line or other purposes; this includes both reclaimed poles as defined below and poles on which the old ground line is sound enough for reuse.

A *reclaimed* pole is one on which a new ground line has been established, either by cutting off the butt or shaving off the decayed wood in the ground line area.

A *select* pole is one which is reasonably straight and not badly spur marked or otherwise unsightly.

A *Type C* pole is a select cedar pole.

A *Type N* pole is a non-select cedar pole.

A *Type P* pole is an ordinary pine pole.

(B) TYPES—The type of poles shown in the table following shall be used for the type of construction indicated and the first type given is the preferred type. Where the first preference is not available, substitutions in the sequence given shall be made (see also exceptions to the sequence given in the rules following the table).

1. Type of Service	Type of Pole or Stub
24-kv. (with or without other wires)	
Rural	Type P or C
Cities, villages	Type C
Distribution	
Cities, villages	Type C
Farm lines	Type N or P
Other rural lines	Type P or C
Poles sold to customers	Type P or C

2. Select poles include unused, select used, and select reclaimed poles.

3. For any pole sold to a customer, a used pole may be used if specially requested by the customer.

4. Type P poles or stubs shall not be used in locations where a dirty pole might be considered a nuisance. Locations to be avoided are streets, alleys, easements, and back lot lines of cities, villages, parks or picnic grounds, yards of residential property, unless the location is shielded by shrubbery or fences, or in general any place where frequent contact by pedestrians is likely.

5. Whenever a good appearance is especially desirable, Type C stubs shall be used. A specific example would be a stub set in front of residential property. Steel stubs may be used instead of wood for the same reason, if it is thought necessary.

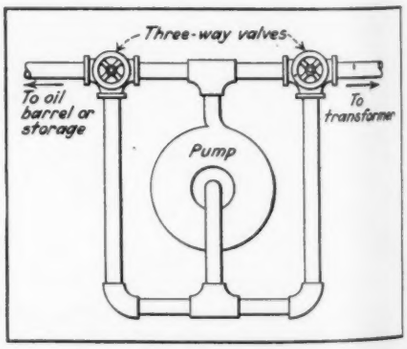
6. Poles furnished by a customer for supporting conductors carrying primary current which has not passed through a customer's meter or automatic disconnecting device (such as a fuse) shall conform to the same requirements as for Edison-owned poles, but for supporting conductors carrying secondary current which has not passed through a customer's meter or automatic disconnecting device other poles butt treated may be substituted, provided adequate clearances and strength are always maintained. Trees may be used for such secondaries, provided care is taken against injury to conductors by swaying of the trees.

7. In general, it is intended that Type C poles shall be used for lines on streets, alleys, easements and back lot lines in cities or villages where 35-ft. or higher poles are required.

•

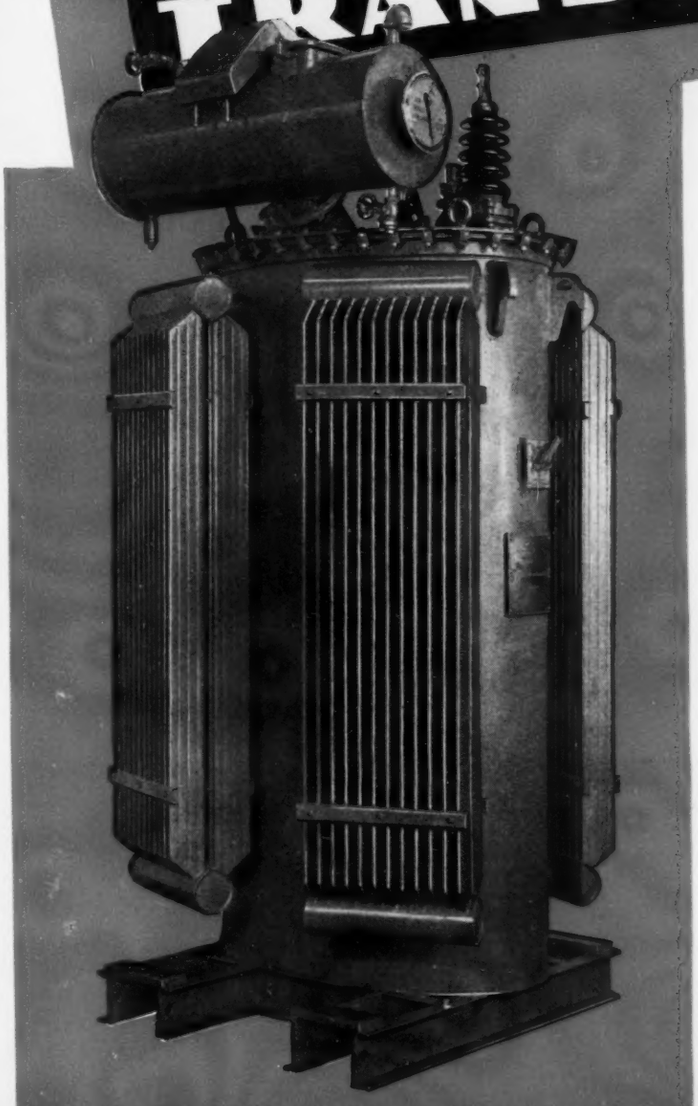
Facilitates Handling of Transformer Oil

When changing oil in a transformer it is usually necessary to reverse the pipe connections of the portable pumping unit in order to fill the transformer tank with fresh oil after the old has been pumped out. This is a time-consuming job and often a messy one if care is not taken that the oil is not drained from the piping before the connections are changed, not to speak of the waste of oil. But in the pumping unit used by the transformer maintenance crew of the Oklahoma Gas & Electric Company this difficulty never arises because the pump is equipped with an arrangement of permanent piping by means of which the direction of oil flow can be reversed without changing any pipe connections. The scheme, shown in the accompanying sketch, consists of a piping assembly with three-way valves on the intake and discharge of the pump. By proper settings of the valves, obvious from inspection of the sketch, the oil can be made to flow in either direction between the oil barrel or storage and the transformer tank.



Reversible flow piping for transformer oil pump

The Only ALL-IN-ONE TRANSFORMER



WHEN you buy a transformer, you want the transformer that gives the most in quality, service and reliabilty. Besides the ordinary things you have come to expect in good transformers, there are certain other essential features necessary for best transmission and distribution practice. Some transformers have some of these features, but the only transformer that has all of these features is the Allis-Chalmers "All-in-One" Power Transformer.

These features include circular coils, shielded construction for moderate and high voltages, internal leads encased in machine-wound tubing, no load tap changer on side of case, combined expansion tank and large diameter relief device, unidirectional breathers, oil sealed inert gas protective system, magnetic oil-level indicators, and seepage-proof welds tested at high pressure.

Typical Transformer for an Industrial Sub Station.

754

TRANSFORMER DIVISION

ALLIS-CHALMERS

MILWAUKEE WISCONSIN

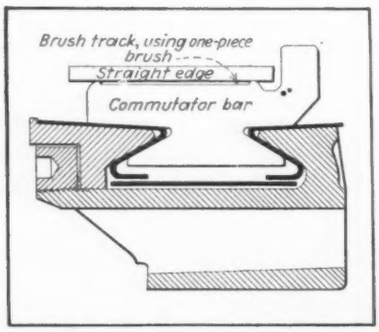
Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Brush Wear on Commutator Face

By J. S. DEAN
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

It is essential to know the brush wear on the face of the commutator when testing various grades of brushes for electrical machines, to determine the one most suitable. On some machines, operating under severe service conditions, it is desirable to use a brush with some abrasive or cleaning action to keep the face of the commutator in good operating condition. If this is not done the commutator may develop etched or burned bars, which gradually develop into flat spots. On the other hand, if the brush has too much cleaning action it will rapidly wear the commutator and shorten its useful life. It is thus advisable to select a brush with the minimum cleaning action, required to keep the face of the commutator clean and free from etched bars and flat spots.



Practical method to check brush track wear on a commutator

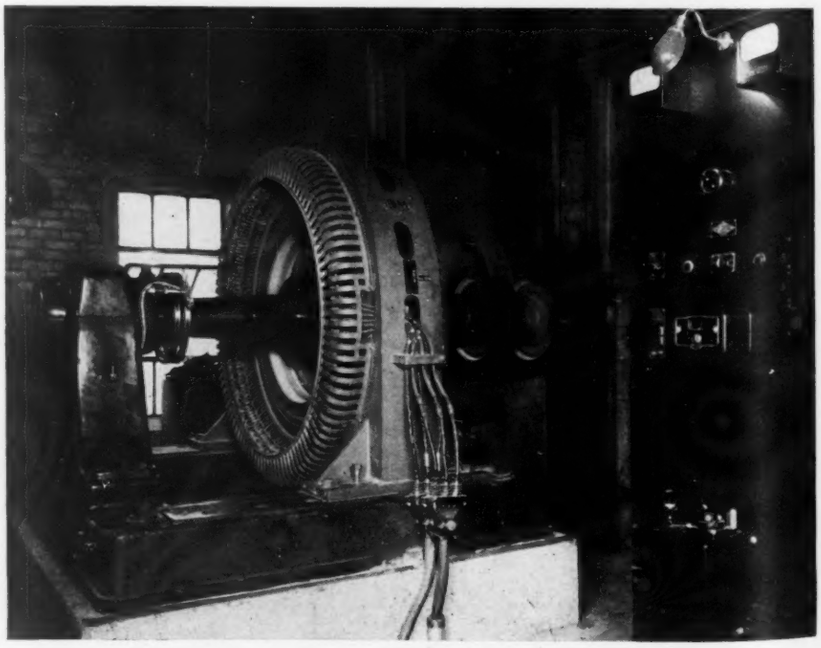
A keyseat rule can be used as the straight edge

The common practice in machine design is to make the total width of the brushes somewhat less than the width of the commutator. It will be noted that as the brushes wear the commutator there are two small projections left on either side of the commutator as shown on sketch. With a straight edge placed on the commutator bars this wear can readily be measured by inserting a feeler gage between the under side of the straight edge and the brush track on the commutator.

As there is a possibility of this wear not being very evenly distributed around the commutator face it is advisable to make the various periodical measurements of wear during the brush test on the same commutator bar, which should be prick-punched to identify it.

Modernized Flour Mill Drive Shows Savings

Reduction in power cost of more than $1,000 per year by improvement in power factor and higher motor efficiency, greater reliability of modern equipment and an increase in mill output of about 1 per cent by higher motor speed are the benefits derived by the Atkinson Milling Company, Minneapolis, Minn., in replacing a twenty-year-old wound-rotor induction motor with this 300-hp., 277-r.p.m. part-winding-start synchronous motor. The shaft, bearings and base of the old motor were used in the new one, thus not only reducing the first cost but, as well, making it possible to cut the mill shut-down time to only three days for the changeover.



New synchronous motor assembly at work. The stator is fixed to the old frame and the rotor is mounted on the old shaft

New standards of living demand new standards of equipment

"Streamlined" Kitchens are a typical example of the electrified home equipment people are buying today. They want new standards of comfort, convenience and labor-saving. And these new standards prove a desire for quality and dependability. Merchandisers who are thriving in this market give them what they want. The very beginning of a dependable electrical installation is Cutler-Hammer Meter and Service Entrance Equipment. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1313 St. Paul Ave., Milwaukee, Wis.

Catalog No. 4331H2—2 fuse, 3 wire switch with sealable dead front plate; adequate wiring space, absence of exposed live parts are two of many features.

The C-H Front-operated Entrance Switch is typical of the great variety of applications covered by the C-H line. They simplify installation astonishingly and are particularly suitable for multiple installation.

Catalog No. 4331H7—Four branch circuits, completely dead-front except in "off" position. Main fuses exposed and main switch opened by opening cover. Branch circuit fuses exposed by opening door.

CUTLER-HAMMER

SERVICE EQUIPMENT

C-H

is

BETTER SERVICE EQUIPMENT

BETTER FOR THE POWER COMPANY
BETTER FOR THE CONTRACTOR
BETTER FOR THE USER

WELDING REHABILITATES WORN EQUIPMENT

Lincoln Electric Company

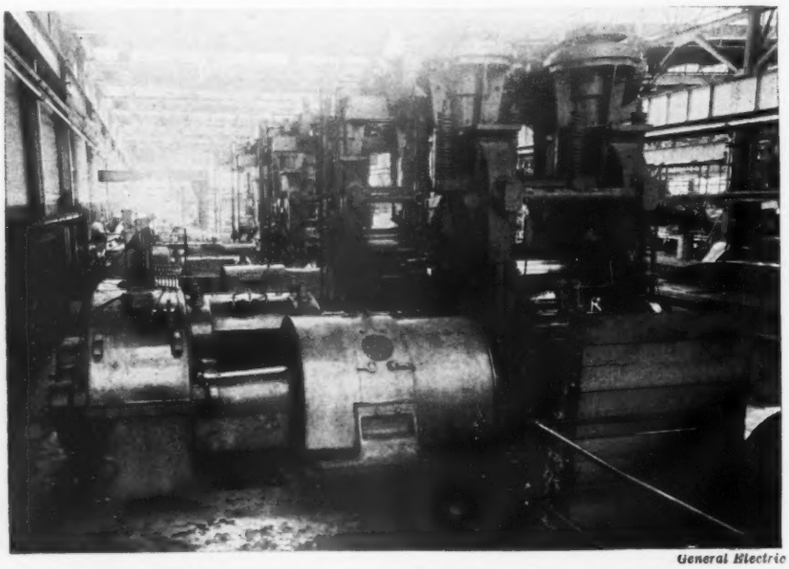
Costly machines formerly scrapped because of wear or breakage are rehabilitated by electric welding for a few dollars compared with a replacement cost of thousands. This illustration shows worn raker bars of a baling machine being reclaimed by welding. Proper choice of electrodes makes it possible either to add long wearing metal to worn parts or provide high tensile strength to welds on broken equipment.

Automatic Breakers Save $20 per Day

An automobile body plant uses a large number of hicycle portable tools along its conveyor lines. Each hicycle feeder line served four portable tools and was formerly protected by fuses. Used along a conveyor production line producing from 50 to 60 bodies an hour, when any one tool extension line shorted the fuse would blow and put four tools out of operation. This made it necessary to stop the conveyor ten or fifteen minutes until the fuses were replaced by an electrician. At least 200 men worked along this production line, and while they were idle they were being paid at the rate of 65 cents an hour. With from 150 to 200 hicycle tools, there was a tool failure at least once a day, resulting in a man-hour loss of approximately $20 per day or $400 a month, based on a five-day week.

Now 35-amp. "Nofuze" circuit breakers protect each group of four portable tools and production man-hour losses are negligible when a tool failure occurs.

ADJUSTABLE-SPEED MOTORS FOR ROLLING MILL



General Electric

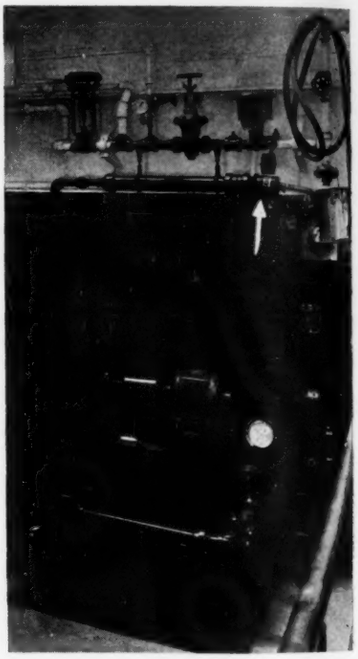
All of the adjustable-speed type with a 2:1 ratio arrangement, the direct-current motors driving this 14-in. tandem mill for the rolling of copper strips at Revere Copper & Brass, Inc., Rome, N. Y., afford adjustments between 400 and 800 r.p.m. for each stand and thus contribute to the flexibility and efficiency of the mill. The first and second stands are driven by 300/400-hp. motors, the third and fourth by 500-hp. motors.

•

Oil Pre-Heater Saves Money on Fuel

By H. R. STEVENSON
Detroit Edison Company, Detroit, Mich.

Oil-fired furnaces in several Detroit plants have been equipped with means for preheating heavier and less expensive fuel oils to make them burn with an efficiency comparable to that of the lighter grades.



Pre-heater allows use of heavier fuel oil

The electric heater, indicated by the arrow, projects into the enlarged section of the fuel oil piping

The simple and inexpensive installation shown in the accompanying illustration uses a 2.5-kw. electric oil immersion heater directly in the line feeding the burners. The heater is controlled manually, but it is conceivable that a fair-sized storage tank equipped with an immersion heater, and connected directly in the oil line, could be automatically controlled, offering the added advantage of a more uniform viscosity for the oil. The unit shown can be obtained completely assembled and ready to connect into the system.

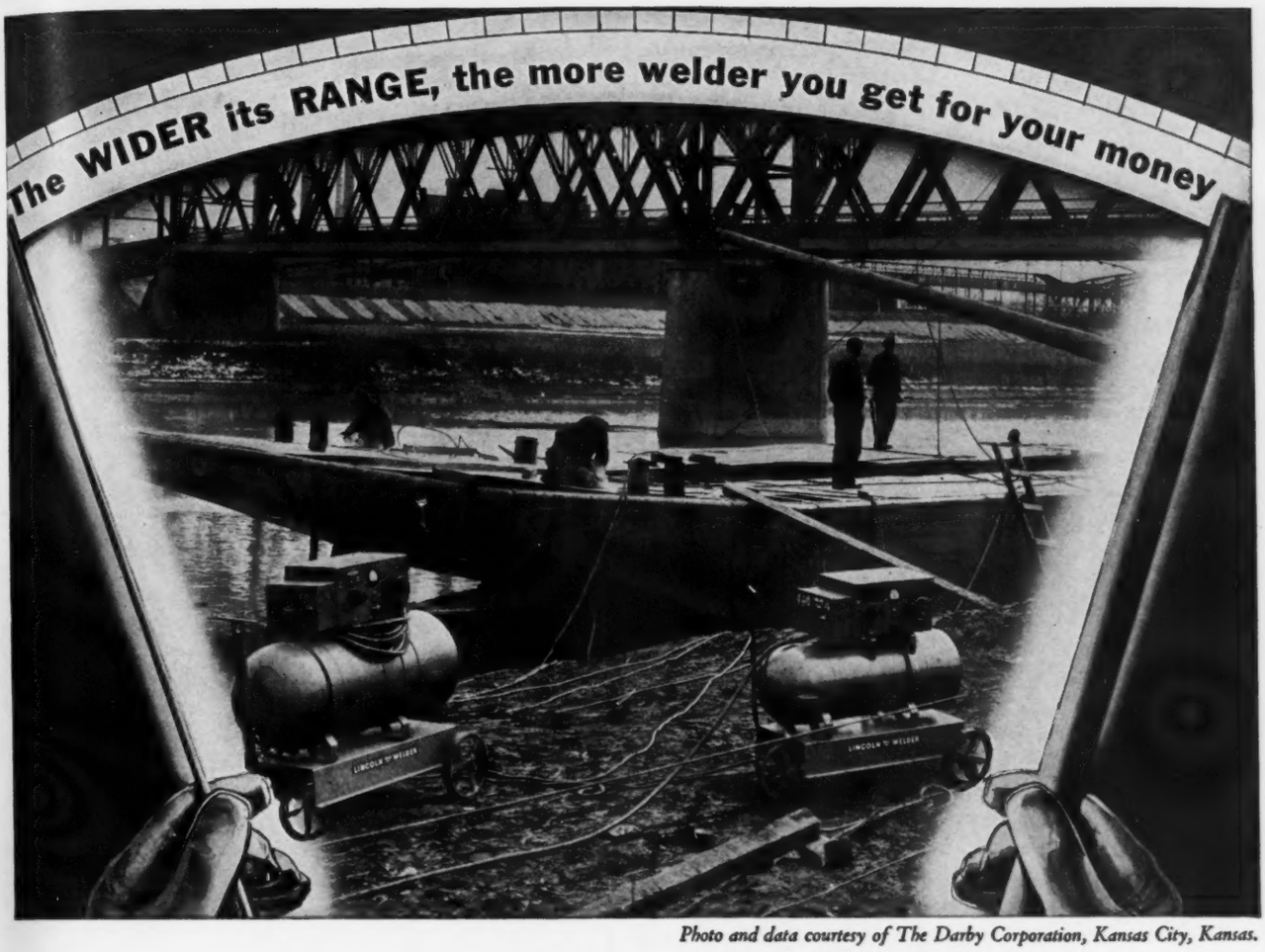


Photo and data courtesy of The Darby Corporation, Kansas City, Kansas.

On All Kinds of Work
THEY'RE GETTING BETTER WELDS AT LOWER COST

For what more could any welding user ask than, "We want welders that will put out the best welding in the shortest time at the lowest possible cost." That was the measuring stick used by this concern in picking the best buy for their welding dollar.

To make a long story short—they tried the New "Shield-Arc SAE"—and *they have replaced their entire fleet of welders with this new Lincoln.*

Much of their welding is out in the open—on boilers, tanks, barges, towers and stacks. On applications such as these, the new "SAE" wins by a mile because it can be set for a "rubber arc," permitting fast, high-quality work under windy conditions.

Other jobs, such as butt welds in heavy plate, call for a forceful, digging arc. The "job selector" of this new Lincoln gives them that type too, at any desired welding heat.

There is never need for a compromise arc with this new welder. You can tune in any TYPE or SIZE of arc for *any* job. It's as simple as a radio. Get complete details about this *accurate, broad-range* welder. THE LINCOLN ELECTRIC COMPANY. Largest Manufacturers of Arc Welding Equipment in the World.

LINCOLN "SHIELD-ARC SAE"

THE WELDER WITH DUAL *CONTINUOUS* CONTROL

THE LINCOLN ELECTRIC CO.
Dept. U-380, Cleveland, Ohio

☐ Please send me a free copy of Bul. 412.

☐ Please arrange a demonstration of the New "Shield-Arc SAE" Welder.

Name _____ Position _____

Company _____

Address _____

City _____ State _____

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

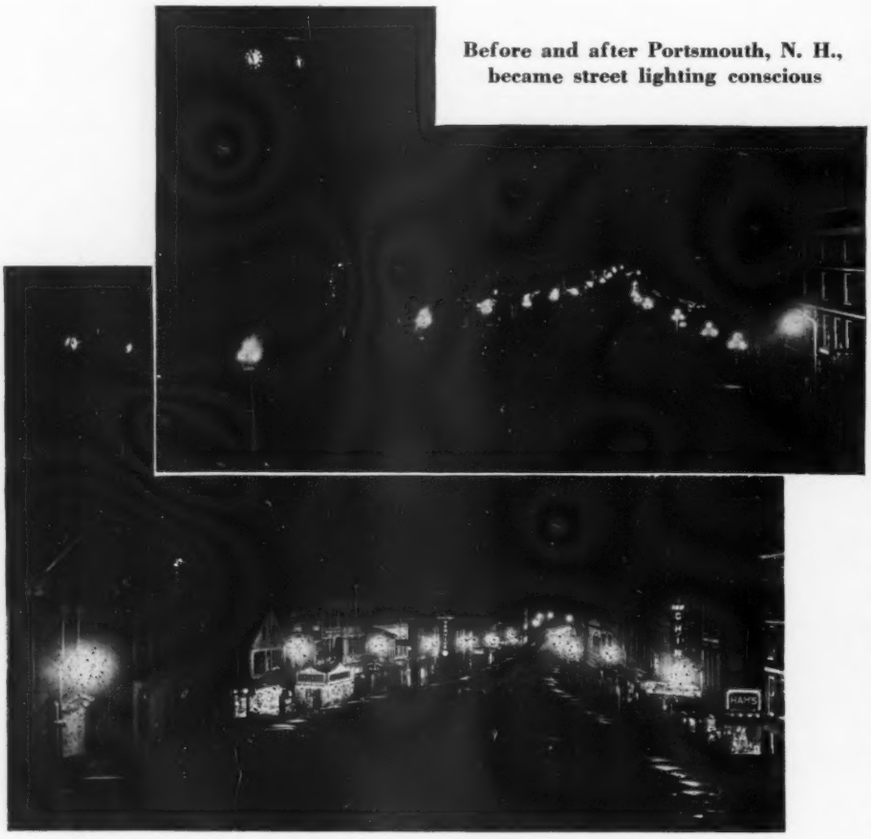
Portsmouth Gets Modern Lighting

By J. L. SCOTT
Supervisor of Power Sales
New Hampshire Gas & Electric Company,
Portsmouth, N. H.

Thomas Bailey Aldrich's "Story of a Bad Boy" would have had a different setting had Portsmouth, N. H., enjoyed today's levels of street lighting in its business district when that distinguished author resided in his "Old Town by the Sea."

As recently as the beginning of 1936 Portsmouth's downtown area was served by 44 standards, each having three 100-watt lamps, the fixtures being spaced 50 ft. apart and being 12 ft. high. The lumens per standard were 4,530 and per lineal foot 83. Even this brilliant contrast to Aldrich's night life era, however, was unsatisfactory, not only from the viewpoint of highway illumination but also from a safety standpoint due to the large amount of traffic. So the local street lighting commission made a study of the situation and recently Mayor Robert Marvin threw a switch which put into operation what was reported to be the first General Electric high-intensity combination mercury-vapor-incandescent system of street illumination to serve a United States city.

The new layout consists of 28 standards, each having one 400-watt mercury vapor lamp and one 200-watt tungsten incandescent inclosed in a medium alabaster rippled globe. The 200-watt lamp operates base up and is equipped with an Alzak aluminum reflector, to diffuse evenly the light immediately under the luminaire, add redness and furnish general illumination as a standby after midnight when the mercury is cut off. The new standards are spaced about 100 ft. apart and the lumens per standard are 19,400, while the lumens per foot are 232, against 83 in the former installation. The public has "taken to" the new installation so actively that the City Council is being petitioned for more units to be located adjacent to the business district. A study is being made of a possible long-term development and systematic installation in an area still to be determined. In all, the total lighting of the business district has been increased 280 per cent, with an increase in maximum load amounting to six electric flat irons!



Before and after Portsmouth, N. H., became street lighting conscious

•

Appliance Selling Stunt

Salesmen of the Electric Appliance Corporation, Austin, Tex., cold canvass twenty homes every morning. At each home they leave a printed tag, identified with dealer name and address, attached to some appliance already owned by the customer. The tag entitles the owner to one free service call on the appliance and enables the salesman to learn what appliances the prospect has and what condition they are in. It also puts the prospect in a frame of mind to talk about new appliances.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

BARE WIRE • MAGNET WIRE • SERVICE ENTRANCE CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE

"Boss, you sure took the kinks out of my work when you put

CRESCENT
INSULATED
WIRE and CABLE
on the job!"

These fellows on the job will tell you Crescent products are flexible and tough . . . easy to work and bend without surface cracking. Besides, they are drawn accurately to gauge, annealed to the correct degree of softness and always clean and bright. If you want to cut time and labor costs on installations that must stand up under severe and constant use—you'll do it better with CRESCENT

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

CRESCENT ENDURITE SUPER-AGEING INSULATION • WEATHER PROOF WIRE

Commercial Campaign That Has Succeeded

By F. A. KOLB
Duquesne Light Company, Pittsburgh, Pa.*

We began getting better acquainted with our commercial customers from a sales standpoint when we stopped thinking of them as 30,000 meters valuable only in the aggregate and began to think of them as individuals. Surveys showed that with a more complete application of electric service these customers would be able to do their jobs better. Believing this, we decided to display vigorously the effectiveness of electric service to them.

These 30,000 commercial customers use slightly over 100,000 kw. of connected electric load. Fifty per cent of this load is lighting, 41 per cent motors and 9 per cent appliances without motors. Last year we supplied them 9 per cent of our kilowatt-hours and they paid us 18 per cent of our gross income at an average rate of a fraction over 4 cents per kilowatt-hour.

To date our activities in the commercial field have been confined to lighting, air conditioning and ventilation. The lighting market can be subdivided into three parts—schools, chain organizations and independent retail outlets. We approach these various markets in the following fashion:

In our school lighting work our advertising and our contacts are directed to the school board. Wherever possible, a sample room is relighted for demonstration at a board meeting. Our sales approach is built around the humanitarian aspect of saving the eyesight of the children. Seeing conditions in more than 600 schoolrooms have been improved in the last 1½ years, adding more than 400 kw. Kilowatt-hours used by 25 schools before and after relighting show an average increase of 38 per cent.

In the chain store field progress was made by getting acquainted with the people in the headquarters who set up the lighting standards. As a result of contacts with them, a large volume of additional business was secured by having the proper size lamps installed in existing equipment. In one case a 5-and-10-cent store group used 300-watt lamps in 500-watt interior fixtures. These were changed to 500-watt lamps in all stores, with the result that the energy used increased 1,200 kw.-hr. per month per store. Inasmuch as the biggest gains in this field are made when a store is remodeled, we keep up a constant barrage of personal letters calling attention to the fact that other companies are improving their stores, and urging them to do likewise. When we analyzed the results of sales work on 34 chain outlets we found an average gain of 25 per cent in the energy used.

The approach in selling lighting to the independent retail outlets is of a standard variety and needs no elaboration. The records on 100 jobs in this group showed that there was a gain of 30 per cent in the energy used. This anaylsis revealed that the average customer used 1,200 kw.-hr. per month before and 1,560 kw.-hr. per month after load was added. This is indicative of the size of the customers in this classification on which we have been working.

To develop the air-conditioning market we have equipped our own stores, co-operated with the distributors in advertising and in a local air conditioning bureau and we have trained men in the proper sales approach. We do not believe that our salesmen should spend time in a consulting capacity on those jobs which are ready to close. Our job is to get the prospects ripe. We go into the places that think it is the coming thing and try to convince them it is here. We tell them how much it will cost and what it will do. In the last 1½ years 450 kva. of air-conditioning load has been added by the group of customers with connected loads from 0 to 20 kva., which we designate as "small commercial." This represents about 25 per cent of the total air-conditioning load added in this same period.

* Abstract of paper presented before Pennsylvania Electric Association.

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Survey Shows Thrift of Electric Cooking

For an average cost of 80 cents per person per month the added benefits of electric cooking were secured by 249 persons in 56 representative homes served by the Boston Edison Company, a recent company survey shows. Furthermore, the total energy consumption in these homes was increased by 24.1 kw.-hr. per person per month after electric cooking was adopted; the average bill per family rose from $4.92 to $8.49, but the average price per kilowatt-hour dropped from 4.88 to 4.08 cents. The average cost of electricity per person for all service increased from $1.105 to $1.909 per month. To obtain these results the monthly service bills of these customers for a year before and a year after the electric ranges were installed were assembled at random from the files of the system.

This survey included a list of household appliances used by each family. Of the 56 cases studied, 45 used electric refrigeration and 57 electric irons were in service, no home being without one. Every family had at least one radio set—there were 65 in the group—and every customer except No. 20 had a vacuum cleaner. Customer No. 16 was the only one without an electric toaster. Thirty-seven had electric washers and 47 had percolators. Only two—Nos. 25 and 35—had electric water heating. The average energy consumption per family before electric cooking went into use was 100 kw.-hr. per month; afterward it rose to 207 kw.-hr.

Energy Consumption Before and After Installation of Electric Ranges

Note.— Tabulated data are given only for the five highest and five lowest customers. Total and average figures refer to entire group of 56.

			Average Monthly Bills			Average Monthly Kw.-Hr.		
	Rooms	Family	Before	After	Increase	Before	After	Increase
	7	7	$4.73	$10.82	$6.09	92	291	199
	10	7	20.71	26.23	5.52	595	779	184
	6	5	6.18	11.32	5.14	128	297	169
	7	9	6.26	11.32	5.06	139	307	168
	5	2	2.87	7.88	5.01	51	190	139
	6	2	2.52	4.06	1.54	44	76	32
	5	3	4.82	6.67	1.85	96	153	57
	6	3	5.55	7.44	1.89	115	178	63
	12	5	8.18	10.24	2.06	168	236	68
	6	6	1.94	4.43	2.49	33	83	50
Total for 56 homes...	419	249	$275.27	$475.54	$200.27	5,644	11,604	5,961
Average.....	7	4.45	$4.92	$8.49	$3.57	100	207	107

No. 6 of a series

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demands a publication with

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which in turn makes

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who are preferred by

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Any publication, particularly one serving an active market, must have editorial vitality, if it is to successfully serve its readers year in and year out. That is the basis of Electrical World's editorial staff — a group of experienced men whose activities carry them to every corner of the country and enable them to feel the pulse of the electrical industry which in turn is reflected in the editorial pages.

Few publications can boast an editorial staff so comprehensive as Electrical World's — yet it is essential to provide the editorial vitality which the industry needs and demands. In addition to 9 editors at headquarters, the staff includes five divisional editors, 10 contributing editors and news correspondents in over 100 cities.

This type of service means keener readers and hence greater attention for your advertising when it appears in Electrical World. Keep pace with the rising trend by tying your advertising to the business-stimulating pages of Electrical World.

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Mercury Lamp
INSTALLATIONS

Besides the Mercury Lamp Transformers, other Jefferson Transformers are made for radio, oil burners, luminous (Neon) tube signs, controls, signals, power circuits, toys, street lighting, railways, and special applications of all kinds.

● Jefferson Transformers have proved their high operating performance on thousands of mercury lamps in many of the country's leading industrial plants. Designed and manufactured by specialists with long experience in the development of transformers for Neon luminous and mercury vapor tubes, sun lamps, street lights—and proven by years of actual service, Jefferson Transformers insure the full efficiency of mercury lamps—full rated capacity, satisfactory performance—and low current demand during the warming-up period. Types for all installations—for both 250- and 400-watt lamps—fully described in new Bulletin 371-MV. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 535 College St., Toronto.

JEFFERSON
TRANSFORMERS

Utah Company Adds Major Appliances

As an opening gun of the 1937 all-industry load-building campaign in the Utah Power & Light territory a 60-day sales drive has been under way on ranges and water heaters. During the past several years dealer co-operation has progressed to the point where the dealers sold 35 per cent of the ranges added to the utility lines in 1936. This year's campaign is designed still further to increase the percentage of business taken by the dealers, both by more aggressive promotion and by careful planning which places all sales outlets on an equal basis.

Details of sales drive

Led by L. E. Baldwin, director of dealer co-ordination for the Utah Power & Light Company, the campaign started January 25 and continued until March 25. During this period purchasers of a new electric range were allowed $25 on any old cooking stove, old electric ranges not being excluded. The offer applied only to ranges that were to be connected to the lines of the utility and its subsidiaries. The power company purchased from the dealer the old ranges taken in trade for $20, the dealer standing the difference.

In addition the utility installed domestic range wiring for $22.50 cash. Costs of installation above that figure were absorbed by the company. Thus every dealer was placed on a par in regard to this item. The company also disconnected old ranges and connected new ones without charge. The utility furthermore services ranges sold by dealers on the same basis as those sold by the company, the customer paying for parts used and a labor charge of $1 per hour.

Installed water heaters

On electric water heaters the utility installed all electric water heaters of 40-gal. capacity sold during the campaign for $5, including both electrical and plumbing connections. In addition, all electrical dealers, plumbers or contractors could list water heating prospects with the company's sales department. All such prospects converted into users earned a bonus of $7.50 paid to the first party who reported them.

Non-Ferrous Silver Brazing in Electric Furnace

[*Continued from page 51*]

was installed. Its connected load is 24 kw. and it can be used up to 1,800 deg. F. *without* a protective atmosphere or up to 2,100 deg. F. *with* a protective atmosphere. Temperature is controlled within close limits by a lens-type radiation pyrometer.

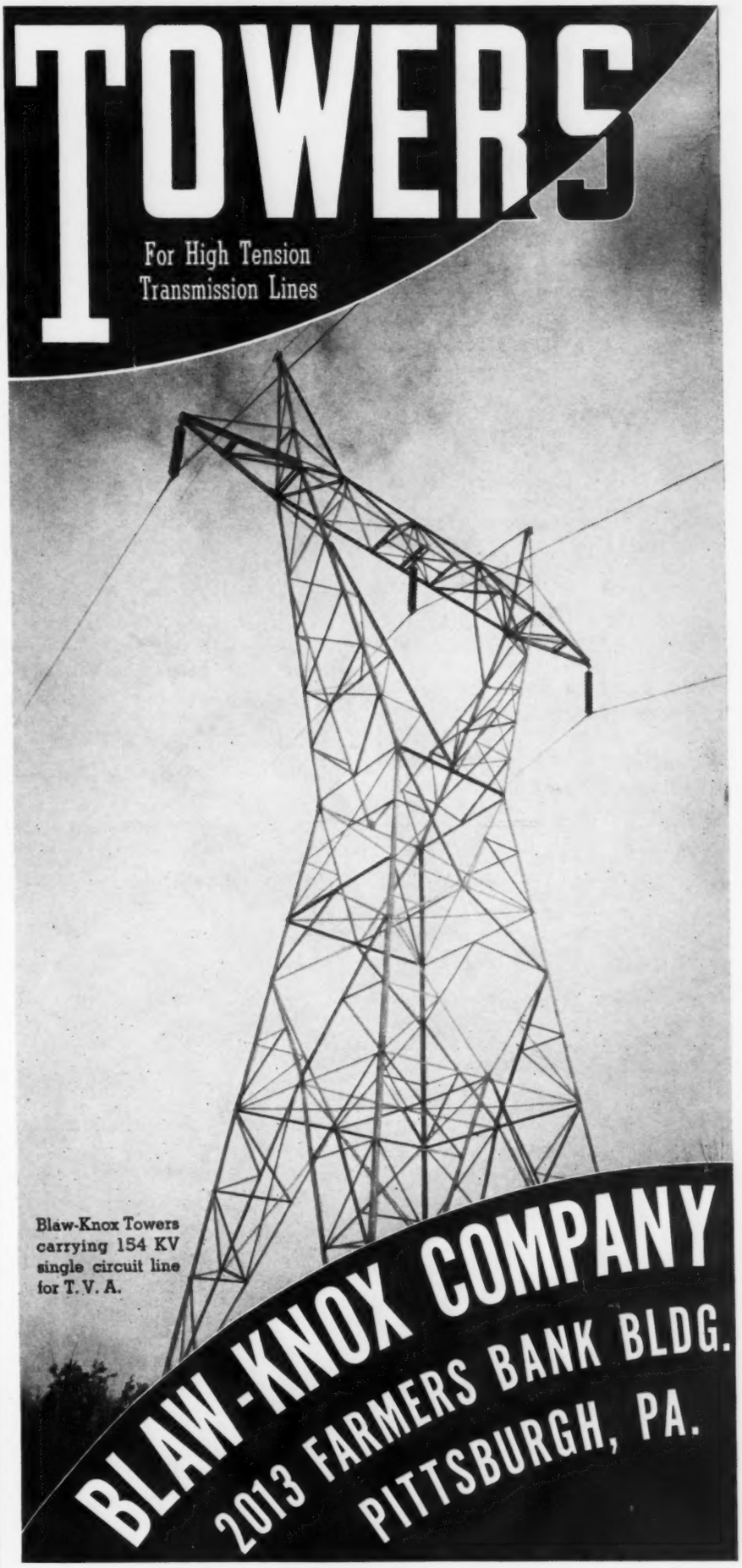
Brass and bronze alloys usually have a melting temperature between 1,500 and 1,800 deg. F.; the parts made of these materials, however, may start to deform by their own weight before the melting temperature has been reached. It also must be considered that zinc, which is a component part of a great many alloys, starts to distill off at 1,664.5 deg. F. If, then, these alloys are subjected to temperatures above this point for any length of time destructive changes may result.

Brazing alloys of higher melting points have been tried out and it has been found that the greatest efficiency can be obtained by using a brazing alloy of the lowest melting temperature and a furnace temperature as high as practical for the metal being soldered. In order to determine the temperature of the furnace, it should be considered in relation to the speed with which the parts can be prepared, placed in the pans and unloaded.

The pans holding the work are so arranged that exactly the same number of pieces are put into the furnace each load. *This is important*, as the brazing is timed to the minute and thus an extra piece will prevent the pan from coming up to correct temperature in the allotted time. After removal from the furnace, the finished parts are restored to their original brightness by a wash followed by a bright acid dip.

For each job it is necessary to work out a separate technique, involving consideration of furnace temperature, firing time, location of piece, quantity and location of solder, as well as whether the parts must be fired on open trays or in closed boxes.

Furnace brazing is best suited to large production quantities as the advantages gained are sufficient to warrant the determination of a suitable technique. Various kinds of bushings and flanges made of brass, steel and bronze are being silver brazed by the furnace method with a decided improvement in appearance and quality and a reduction in the cost of production over methods previously used.



New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Portable Tester for Boulder Generators

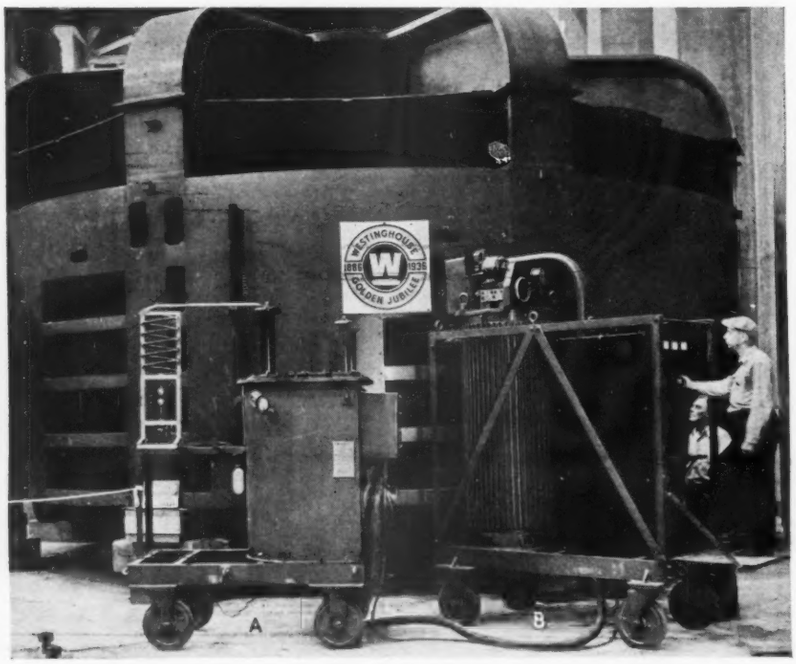
By H. S. GATES
Engineering Department,
Westinghouse Electric & Manufacturing Co.

A portable test set having a maximum rating of 450 kva. for 30 minutes at 70,000 volts and zero power factor leading will be a permanent part of the plant equipment in the power houses at Boulder Dam. Built by the Westinghouse Electric & Manufacturing Company, this set will be used to make armature dielectric insulation tests on the 82,500-kva., 16,500-volt generators at 34 kv.; on the 40,000-kva., 13,800-volt generators at 28.6 kv.; on the 23-kv. substation bus structures for the 82,500-kva. and 40,000-kva. generators, 55,000-kva. and 13,333-kva. transformers at 54 kv.

Divided into two parts, the set consists of a 70,000-volt transformer and 62.5-mm. adjustable spark gap and resistance rack mounted on one portable truck and a 112.5-kva., 2,300-volt induction regulator and control cabinet with test panel mounted on a second truck.

High-voltage windings of the transformer are designed for series or parallel operation for 70,000 or 35,000 volts. Low-voltage windings are rated at 4,600 volts. The 2,300-volt induction regulator provides 100 per cent buck and boost and thus permits excitation of the transformer over a range of zero to 4,600 volts, providing test voltages of 1,000 to 70,000 volts. A third winding is built into the transformer and closely coupled with the leakage flux to give accurate voltmeter readings. A compensator coil connected in series with this winding and in series with the high-voltage load current makes allowance for transformer voltage regulation. The transformer is designed to have 50 per cent exciting current at full boost position of the regulator (4,600 volts). This lagging current at near zero power factor offsets part of the zero power factor leading load and permits use of a smaller, more compact regulator.

Mounted on the truck with the 112.5-kva., 2,300-volt regulator is a control cabinet containing a 2,300-volt manually operated double-pole, single-throw oil circuit breaker of 25,000-kva. interrupting capacity. Meters mounted on the test panel include an ammeter with a scale reading from 0 to 100 amp. and two voltmeters. One voltmeter reads from zero to 1,000 volts, the other has two scales reading from zero to 35,000 and zero to 70,000 volts. Provision is made on the cover of the transformer for a portable ammeter if needed.



Portable two-part dielectric strength test set to be used in periodic test of Boulder Dam generators

(A) 70,000-volt transformer and adjustable spark gap. (B) Induction regulator and control cabinet.

•

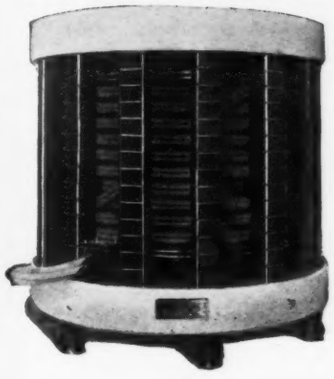
Brooklyn Devises Range Service Units

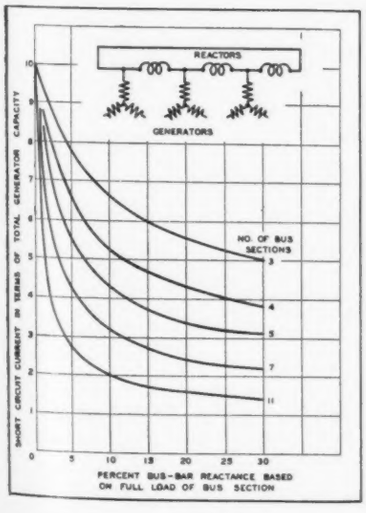
By GEORGE F. ELSEN
Assistant Engineer Meter Bureau,
Brooklyn Edison Company

Four objectives were aimed at in the adoption of a new meter and service equipment occasioned by the range promotional results following an inducement rate: (1) Reduction in installation cost, (2) reduction in space requirements, (3) introduction of new sequence metering, (4) more tamperproof equipment.

To achieve the four objectives, it was found desirable to combine all the separate articles of equipment in one cabinet, making all intermediate wiring of parts a permanent bussing. It was believed that the new sequence of metering would permit the use

IN DETROIT AS IN MANY OTHER METROPOLITAN AREAS





MURRAY REACTORS

PROTECT DISTRIBUTION SYSTEMS

Here in a few words is what Murray Low Loss Reactors mean to the power plant, for, even if equipment is the last word in the electrical art, they will relieve short circuit stresses and support the continuity of the generator output — promptly, reliably and efficiently.

For the sake of analogy think of the power plant as the ocean shore—the never ending waves as the constant surges on lines and equipment.

And then consider Murray Current Limiting Reactors interposed between your power plant and line disturbances—just as breakwaters protect the shore line.

Reactors in all cases, whether they are generator, bus tie or feeder reactors, should be placed as close to the bus as possible in order to protect the bus under the greatest number of conditions.

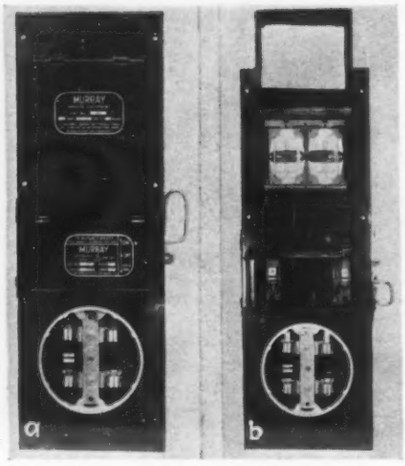
The indoor, open type bus reactor illustrated is rated, 1336K.V.A., 4060 amperes, 11.4K.V., 25 cycles. It is completely fireproof.

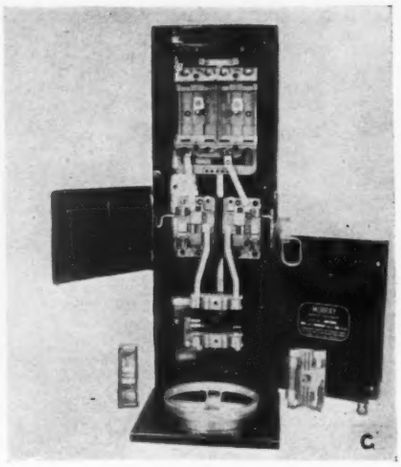
Diagram shows reduction of bus short circuit current with sectionalizing through insertion of Murray Reactors between sections.

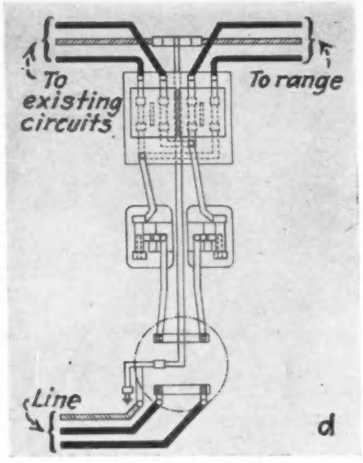
We invite inquiries and request your specifications.

METROPOLITAN DEVICE CORP., BROOKLYN, N.Y.

MURRAY LOW LOSS REACTORS







Meter and servicing designed for single meter range job

(a) Covers closed; ready for socket meter.
(b) Accessible "innards" exposed.
(c) Open to show bus wiring.
(d) Circuit arrangement.

The service side of the meter socket is completely separated from the load side by a metal barrier and the connections between the load side of the socket, the service switch and the control pull-fuses are all permanently made with copper bus. The neutral is run from the left-hand side of the service compartment up the center of the load compartment behind the switch and fuse blocks to the top of the cabinet.

of the most compact equipment.

Since the range service in Brooklyn is generally 120-208-volt, three-wire, the recently-developed compact, two-element, three-wire meters, mounted on standard type A and type S bases, were considered for the new equipment. The type S meter was selected as it can be installed in a smaller space and makes a more tamper-proof job because the terminals are inaccessible when the meter is set.

The development, which is now being installed on single meter jobs, is shown in the accompanying illustration, including a typical installation.

When installing this equipment, it may be placed over the service pipe, or a splice box may be used over the service pipe and connections run from it to the equipment. For overhead service, knockouts are provided in the lower compartment for service cables. The service cables are connected to the equipment by means of mechanical connectors, and the load connections are made at the top of the cabinet in a similar manner. With this equipment, installation costs have been reduced approximately 30 per cent.

The S type meter can be tested in place by removing the glass cover and opening the door over the service switch compartment. Jumpers to bypass the meter are connected from the service terminals on the front of the meter to the connection studs on the load side of the service switch. When the service switch is opened the customer's load is completely shunted around the meter.

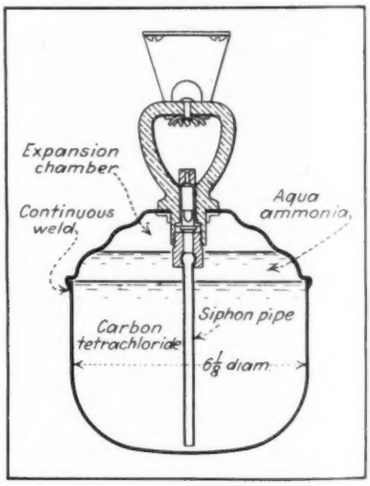
•

Transformer Fire Put Out in a Minute

To simulate as closely as possible the conditions present in an indoor transformer fire subjected to automatic chemical extinguisher operation, the Firetox System, Inc., recently made a demonstration near its Attleboro, Mass., headquarters for the benefit of a group of New England public utility engineers. Conditions of the test were set up as advised by utility men specializing in distribution problems. The main purpose was to determine the ability of this type unit to control a large volume of freely burning transil oil.

A test house of a light joisted wood construction, asbestos insulated and having a cement floor was used. In the center of the building a pit was constructed 4 ft. square and 6 in. deep. A 10-kva. transformer case was placed here and filled to the oil level with transil oil. The pit was flooded with such oil to a depth of about 1 in. About 1.5 gal. of gasoline was poured into the oil in the transformer shell and the pit in order to build sufficient temperature to ignite the oil and create a freely burning fire. A trapdoor above the main door enables two "Firetox" units to be run into the house by pulley after the fire burns freely.

The gasoline and oil were ignited by means of gasoline-soaked wicks, the fire being allowed to burn with both windows and door open. The thermometer readings taken after ignition of the inflammables show that within 30 seconds the inside of the building reached 240 deg. F., and in 2.5 minutes the reading was 600 deg., when the thermometer was withdrawn through the wall orifice which held it. The oil in the casing and in the pit were then blazing freely. Three minutes after ignition the extinguisher units were run into the building and the door and windows were closed. About 45 seconds later both units operated, spraying fluid upon the flames from the upper part of the shack interior. One minute later the thermometer was run into the house and the temperature had fallen to 240 deg., indicating that the fire had been put out. The maximum temperature reached inside during the height of the fire was unknown, as the thermometer did not read above 600 and had to be removed to prevent breakage. Examination of the interior of the building 45 minutes after the fire showed complete performance. At the time the temperature had fallen to 135 deg.



Bomb extinguisher operates on vapor pressure

Extinguishers contain 2 qt. carbon tetrachloride and 1 pt. of 28-deg. ammonia on top of the "carbon tet." As temperatures rise above 60 deg. F., pressures in the container increase from zero upward. A column of glycerine supports a gold diaphragm against these pressures up to 25 lb. per sq.in. The glycerine is contained in a nozzle having a soldered cap. Under fire conditions, the solder melts on reaching 160 deg., releasing the glycerine column. Pressure of the order of 80 lb. per sq.in. forces the carbon tetrachloride out of the container through a siphon tube, breaking the now unsupported gold diaphragm and discharging the tetrachloride as a fine mist over a circle about 12 ft. in diameter.

A Business Paper Advertisement Writes Home

Dear Boss:

Am I dog-eared!

But you warned me that 'ELECTRICAL WORLD' covered this industry from attic to cellar. I didn't know there were so many important guys in any line! And is it humming? — Electric power's making the old all-time peaks look like mole hills!

This is some change from other magazines I've worked in. No rest here, Boss. I'm passed around so fast my staples smoke — fact. Treat me rough, too. Initial me ... tear out my address ... turn down my ear corners.

Saw your star salesman in the lobby yesterday. I was on the way to the Big Shot's desk, and only had time for a wave. "Go get him, kid." says he. "Soften him up for me." You've got a swell gang of salesmen, Boss — we hit it off like that! (And don't forget I save you dough on Traveling and Entertainment vouchers, hey Boss?)

From all the birds who matter in company buying, that 'ELECTRICAL WORLD' hits, I'd say your sales quota was in the bag right now. All the Big Volts and Head Amperes — over 40,000 of them — take a personal, first-hand shot at me. I don't see how those McGraw-Hill boys do it for a fraction of a cent a call, but that's their funeral, hey?

Well, guess I'll hit the desk for a few winks now — I get no chance to relax by day any more. You'll be hearing soon — in orders.

J. Tellem

P. S. This 'ELECTRICAL WORLD' you sent me out with, is only one of McGraw-Hill's 24 business papers. Better look 'em over, Boss. You may be missing some good bets.

News ABOUT PEOPLE

H. H. Kuhn Vice-President Kansas City Power & Light

H. H. Kuhn was elected vice-president of the Kansas City Power & Light Company at a recent company meeting. Mr. Kuhn, until recently

assistant to the president, J. F. Porter, joined the company in 1918. Before going to Kansas City he was associated with Mr. Porter in other utility operating companies in Iowa and Illinois. As assistant to the president his duties involved handling a volume of detail necessary to establishing and maintaining company rate schedules. A considerable portion of his time was spent in the supervision of outlying properties and the power sales division of the company. He is a graduate of the University of Illinois, in mechanical engineering.

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Hallet Gildersleeve Named to New Position

Hallet Gildersleeve has been appointed assistant general manager in charge of merchandising for the Iowa-Nebraska Light & Power Company of Lincoln, Neb., to fill the vacancy created by the recent death of Stanley Taber, according to L. R. King, president. Mr. Gildersleeve, who has been with the company for the past nine years as sales supervisor of the Lincoln district, will now supervise merchandise activities of the entire fourteen districts of the company, including Lincoln.

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Wisconsin Power & Light Elects Two New Executives

Milton H. Frank was elected vice-president of the Wisconsin Power & Light Company at a recent meeting of directors. Mr. Frank has been with the company since its organization, starting in 1918 as district manager at Fond du Lac for the Wisconsin Electric Company, which in 1924 became the Wisconsin Power & Light Company. He served as division manager for the Fond du Lac and Sheboygan territory until 1930 and later went to Beloit as division manager for

M. H. Frank

the southern division of the company. In 1935 Mr. Frank was transferred to the Madison offices as assistant to the president.

E. A. Barth

Eugene A. Barth was made assistant to the president to succeed Mr. Frank. For the past sixteen years he has been associated with the Business Research Corporation of Chicago and in this connection was active in the development of improved methods and economy measures in the public utility field.

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▶ EDMOND C. POWERS has been named assistant secretary of James F. Lincoln Arc Welding Foundation.

▶ EDWARD PREZZANO, president of the Westchester Lighting Company, has been elected a director of the Brooklyn Edison Company, to succeed J. F. Becker, resigned.

▶ ALLEN VAN WYCK of Chicago was elected a director of the Potomac Electric Power Company at the annual meeting.

▶ OLIVER W. GATCHELL has been appointed chief engineer of the rural electrification division, Copper Wire Engineering Association. For the past three years he has been with the Corps of Engineers, U.S. Army, as electrical engineer and chief of the public utility

section, Muskingum flood control project, at Zanesville, Ohio. Prior to 1933 he was with the Electric Bond & Share Company designing and constructing transmission lines.

▶J. S. WEIR, engineer of the Mississippi Power & Light Company for several years, has been named manager of the Mt. Olive, Miss., plant to succeed C. E. Vaughn, retired.

▶MERTON T. CARTER, in charge of merchandise sales for the Berlin, N. H., division of the Twin State Gas & Electric Company, has been appointed manager of the Lancaster and northern districts, succeeding Orville L. Evans.

▶S. B. E. THOMPSON has been named senior valuation engineer with the New York State Public Service Commission with offices at Albany, N. Y. Mr. Thompson, who for several years was manager of the Bluefield Gas & Power Company, has been with the J. G. White Engineering Corporation of New York City.

▶C. C. CRANE, formerly electrical engineer in the bridge division, Michigan State Highway Department, Lansing, has joined the Chicago District Electric Generating Company as assistant electrical inspector on the construction of unit No. 2 in the State Line plant.

▶LAWRENCE H. LUND was elected assistant treasurer of the Westinghouse Electric & Manufacturing Company at a recent meeting of directors. Mr. Lund is auditor and director of various subsidiary companies of the Westinghouse Electric International Company, which he joined in 1921 as auditor. East Pittsburgh will be his headquarters.

▶RALPH D. STAUFFER, for the past five years supervisory engineer of the New England Gas & Electric Association properties with headquarters at Cambridge, Mass., has been transferred to the headquarters offices of the E. M. Gilbert Engineering Corporation at Reading, Pa., where he will be contact engineer for the Associated system properties identified with this organization's work. He has been succeeded at Cambridge by Edward H. Steele, electrical engineer of the New England properties at Cambridge for the past five years and formerly electrical engineer of the New Bedford Gas & Edison Light Company.

Toner Boston Edison Auditor

James V. Toner, professor of accounting of Boston University College of Business Administration, has been appointed auditor of the Boston Edison Company, a newly created post. A native of North Attleboro, Mass., he has had a notable career in the accounting field, subsequent to graduation from Holy Cross College in 1912. He qualified as a certified public accountant in Massachusetts in 1920 and has been a member of the university teaching staff since that year. As senior partner of James V. Toner & Company, Boston, he specialized in tax and business reorganization affairs and maintained important executive connections in the jewelry manufacturing field, as well as in banking and commercial organizations. Mr. Toner is author and co-author of a number of standard books on accounting practice, is a director of the Attleboro (Mass.) Steam & Electric Company and a member of the American Institute of Accountants. In 1926 he organized the College of Business Administration of the University of Porto Rico.

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▶LAURENCE A. DUNN, formerly connected with the appliance division of the Westinghouse company at its Boston offices, has been appointed merchandising manager of the United Illuminating Company, New Haven, Conn.

▶B. J. BRUGGE, who has spent two years superintending welding operations in the Near East, has been appointed to the sales staff of the Lincoln Electric Company in Los Angeles, Calif. For several years Mr. Brugge was employed in the Lincoln research laboratory. In 1933 he was given leave of absence to assist in the application of electric welding in the Near East. In the capacity of welding superintendent for the Anglo-Iranian Oil Company he spent two years in Persia. Later he transferred his interests to England, serving as welding consultant for firms in that country and in Scotland.

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OBITUARY

▶HARRY H. VAN STAAGEN of Pelham, N. Y., an electrical engineer formerly employed by the Westinghouse Electric & Manufacturing Company, died, at the age of 65, on March 27.

▶LEROY S. COLBY, formerly superintendent of the electrical department of the Lawrence (Mass.) Gas & Electric Company, died at his home in Methuen, Mass., March 20.

▶COL. JOHN E. SPENCER, inventor of the Spencer damper regulator and a recipient of the John Scott medal for contributions to engineering development, died at the Salem (Mass.) Hospital on March 31, aged 76.

▶ARTHUR MOLYNEUX SILLAR, one of Britain's outstanding consulting electrical engineers, recently died at the age of 72. When he was 18 he joined the staff of the Jablockhoff Electric Company, London. He was associated with Sir Charles Manville and later with R. Venner, inventor of the Venner time switch. One of the oldest members of the Institution of Electrical Engineers, he was also a member of the Institutions of Civil and Mechanical Engineers. He was made M.B.E. for his valuable war work at the Ministry of Munitions.

▶EDWARD C. MASON, general attorney of the New England Power Association, vice-president and treasurer of the Massachusetts Utilities Associates and for many years prominent in northeastern utility circles in connection with commission regulative activities, died suddenly at his home in Winchester, Mass., on March 31. He was born in Ravenna, Ohio, in 1864 and was educated at Harvard College, receiving an LL.B. from the Harvard Law School in 1890. He was a member of the American Bar Association, American Academy of Political and Social Science and other organizations.

Manufacturing AND MARKETS

Three New Standards Released by NEMA

The National Electrical Manufacturers Association has released three new standards. The NEMA Attachment Plug Standards, Pub. No. 36–40, 25 cents, concerns the manufacture and test of attachment plug caps, bodies and receptacles. It covers, among other things, the dimensional standards that have been set up for the 2-, 3- and 4-pole caps and receptacles.

Information available on the manufacture, test and performance of oil circuit breakers and power switchboards is given in NEMA Circuit Breaker Standards, Pub. No. 36–38, 90 cents, and NEMA Power Switchboard Standards, Pub. No. 37–39, $1.10. The material supersedes that which appeared in the NEMA Switchgear Standards. No. 31–10, released in 1931. Copies of the publications can be obtained from the association, New York.

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Demand Union Recognition

The United Electrical & Radio Workers of America, which has been conducting a sit-down strike at the plant of the Emerson Electric Company, St. Louis, Mo., since March 8, has submitted demands for union recognition on the Century Electric Company and on the Baldor Electric Company. Recently employees of the Century concern and of the Wagner Electric Corporation were granted wage increases.

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Sit-Down Strike Ended

A sit-down strike at the Minneapolis plant of the Waters-Genter division of the McGraw Electric Company was ended last week and the 350 employees have returned to work. A settlement was worked out after negotiation between company officials and representatives of Union 382 of the International Association of Machinists.

•

Sales of Automatic Heating Equipment Seen 1,000 a Day

The air conditioning division of General Motors plans an immediate sales campaign of automatic heating and air conditioning units and will use the nearly 2,000 retail outlets of Delco-Frigidaire, according to James J. Nance, general sales manager.

Mr. Nance stated that 60 per cent of the automatic heating equipment sales last year were made to buyers with incomes between $1,800 and $4,500 a year. He estimated that 1,000 automatic heating equipment sales a day will be made this year, of which 150 to 200 will be for homes built during the year.

Makers of Appliances Advance List Prices

A further mark-up in prices of household appliances is expected with steadily rising raw material and labor costs. Recently leading manufacturers have increased prices for major appliances.

Prices of General Electric Company electric refrigerators have been advanced $8 to $24 in the Pittsburgh district in the second advance thus far this year. Prices were also increased in Cleveland. The advance is expected to become general.

Distributors of Frigidaire products are expecting an advance in prices. Late in February Frigidaire division of General Motors Corporation advanced prices an average of more than 5 per cent above original 1937 list prices. The expected mark-up is likely to be greater than 5 per cent.

LAUNDRY TROPHY AWARDED—The L. L. Shawber Trophy in the National Laundry Equipment sales contest sponsored by Westinghouse was presented at a victory dinner in Toledo, Ohio. The photograph shows J. Sidway, manager of Westinghouse Electric Supply Company, at Cleveland, receiving the award from O. I. Alverson, representing the Westinghouse laundry equipment sales manager. With Mr. Sidway are J. H. Campbell and E. C. Brode, both of Westinghouse Electric Supply

MB-139

A VERTICAL BREAK-SWITCH OF THE ROTATING INSULATOR TYPE

(7.5 to 161 Kv.)

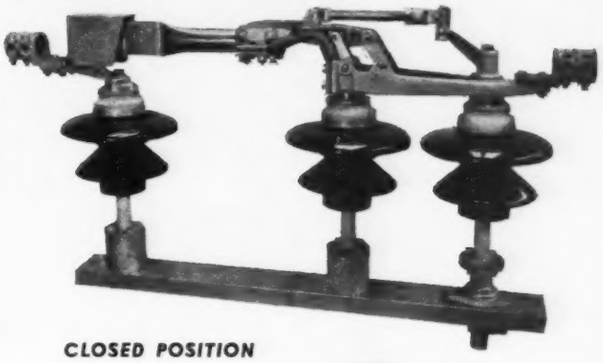
FOR LOWER COST PERFORMANCE UNDER ALL CONDITIONS

• Less worries for you—less maintenance, adjustment, and lubrication — less operating costs—that's what Delta-Star engineers have made possible for you with this switch.

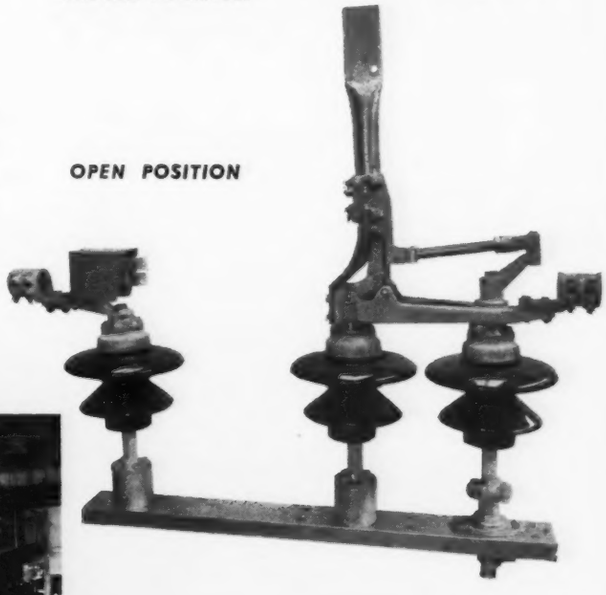
Here is dependability of operation under sleet, snow, or ice conditions—where there are large amounts of dust and dirt, or a corrosive atmosphere.

Available in types for Load Breaking—or disconnecting service — for manual or motor operation. They comply with Standard NEMA ratings.

Accurate contacting, smooth operation, easy blade movement are realized day after day.



CLOSED POSITION



OPEN POSITION

Assembling 34.5 kv. 1200 ampere "MB-139" Switches.

• The smooth, easy movement, free from shocks, stresses, or jars is an important feature in reduction of maintenance costs. The operating mechanism connecting pipes cannot slip and throw the switch poles out of adjustment — our patented piercing set screws insure against slippage. Complete details in Bulletin 39-B.

• 7.5 to 161 Kv.

DELTA-STAR ELECTRIC CO.

2400 Block, Fulton St. Chicago, Illinois

When you need high voltage equipment . . . CONSULT DELTA-STAR FIRST

Crosley Radio Corporation is not following immediately the general price advance understood to be pending at this time. Prices will be increased, however, as soon as such advance would be equitable to dealers who are now understocked. Fire and flood prevented the corporation from making normal first-quarter deliveries of electric refrigerators to distributors and dealers. The price list on the 1937 line was 5 to 10 per cent higher than on comparable 1936 models.

Washing machine makers have made some increases recently and a leading producer is putting an advance of 10 to 15 per cent in effect on April 15.

Landers, Frary & Clark have advanced prices on Universal Electric appliances, effective as of April 1. The company states that the greatly increased cost of manufacturing, due to increases in material costs, labor rates and advanced taxes over a year ago, makes it imperative to advance prices.

•

Shipments of Laundering Units Higher for Period

Household washers and ironers shipped in the first two months this year totaled 302,089, a gain of 11 per cent over a year ago, according to J. R. Bohnen, secretary of the American Washing Machine Manufacturers' Association.

Washers totaled 271,288, a gain of 10.36 per cent, and ironers were 30,801, up 17.35 per cent. Washers shipped in February totaled 149,534 and ironers 14,944.

•

Expansion Necessitates Move

Capitol Stage Lighting Company has announced the removal of its offices from 626 Tenth Avenue, New York, to its own building at 527 West 45th Street. The move was necessitated by constantly expanding business. According to present plans offices, showroom and factory will be ready for inspection by the first of May.

New York Metal Prices

	March 31, 1937 Cents per Pound	April 6, 1937 Cents per Pound
Copper electrolytic	17.00*	17.00*
Lead Am. S. & R. price	6.95	6.90
Antimony	16.50	16.50
Nickel ingot	35.00	35.00
Zinc spot	7.85	7.85
Tin Straits	64.75	62.875
Aluminum, 99 per cent	20–21	20–21

* Delivered Connecticut Valley.

Field Reports on Business

There appears to be no slackening in activity in the utility industry as evidenced from field reports to ELECTRICAL WORLD. *Electrical equipment buying is moving ahead. Demands for industrial electrical equipment is being felt in increasing volume. The recent rise in list prices of refrigerators is reflecting the movement to pass on to consumers higher material costs and wages. Rural electrification is expanding.*

NEW ENGLAND

Electrical equipment buying in this area is moving ahead, with no signs of slackening-off in sight. Orders for industrial apparatus are being received in good volume, stimulated, in the opinion of one well-known distributor, by rising prices and uncertainties as to quick deliveries. While labor conditions for the most part are stabilized for the time being among the most important industries in this district, there is some apprehension for the latter part of the year; this in a considerable degree has accelerated buying by industries and central stations.

Switch and control apparatus orders are heavy; central stations are buying larger amounts of hardware, wire, pole-line materials and fiber conduit than is usual at this time. Intercommunication supplies are attracting interest; shipbuilding yards are in the market quite actively for small electrical cooking and refrigeration units. Commercial electric cooking is active and several large installations are pending. Electric lighting for factories, after a long lull, has become quite active and one layout department of a prominent utility reports an encouraging number of projects under consideration.

With the present status of the electrical market here decidedly healthly, a view ahead presages a continuance of this trend. The Public Service Company of New Hampshire will build a 33-kv. transmission line, 8.6 miles long, between Swans Fall, Me., and the Conway, N. H., district, at an estimated cost of $40,000. The Central Maine Power Company will spend over $1,000,000 this year for extensions and new projects. Considerable construction work is being done on its 33-kv. lines in connection with the extension of service to outlying districts; a new connection will be made at Livermore Falls, tying in the service at Livermore and vicinity to this company's 110-kv. line.

CHICAGO

Reports from various branches of the electrical industry indicate substantial increases for the first quarter of this year over 1936. Purchases by utilities in this area surpassed last year's volume by a wide margin and are moving steadily higher. Wholesalers' net sales average approximately 63 per cent above the corresponding period last year. Following the consistently higher trend of building, electrical contractors' activity shows a healthy growth. Reports from manufacturers are equally gratifying as sales of practically every line of equipment ran well above the 1936 levels. The rapidly increasing volume has forced many local manufacturers to expend their facilities, one building a new $1,000,000 plant, while another prominent firm is more than doubling its capacity.

Orders for lighting equipment continues at a rapid pace; one company reports sales approaching an all-time high. Transformers are in demand, one order placed last week calling for 800 525-watt pole-mounting type and 450 550-watt manhole type. Appliance sales made steady advances during the first quarter, refrigerators, washing machines and cookers showing up especially well.

General business in this section continues to forge ahead or hold gains previously attained. Employment and payrolls made small gains, mostly as a result of strike settlements. Freight traffic and electrical energy output moved higher.

NEW YORK

Plants in this section, in many instances, are operating at near capacities, with the prospects of good spring business. Appliance sales continue to dominate the retail markets, with the likelihood of increasing activity in air conditioning. Forward orders for heavy equipment are being placed in larger volume because of the uncertainty of early delivery. With power output holding up well near the year's peak, utilities are finding it necessary to revamp distribution facilities. This type of buying is being evidenced by equipment manufacturers.

Rural electrification promises to set a new record this spring and summer with more companies adding to earlier budget estimates.

Equipment makers are passing higher costs and wages on to the consumer by raising list prices of appliances. Prices of refrigerators have been increased recently with the prospects that the same will apply to other lines in the near future.

PACIFIC COAST

Business continues excellent, with buying by utilities still the leading feature. Poles, crossarms, hardware and insulators are the chief items for shipment to specific central points for general redistribution rather than for extensions into new territory. Privately owned utilities of eleven Western states will spend $33,000,000 during this year for capacity increases and service extensions. Recent machinery orders reflect these plans and include $95,000 switchgear and a 4,000-kva. transformer, value $60,000, for Pacific Gas & Electric; a 228-kva. regulator, value $5,000, for Reno; $40,000 of reactors for the Bay region and $14,000 of transformers and $4,000 of wattmeters for Los Angeles.

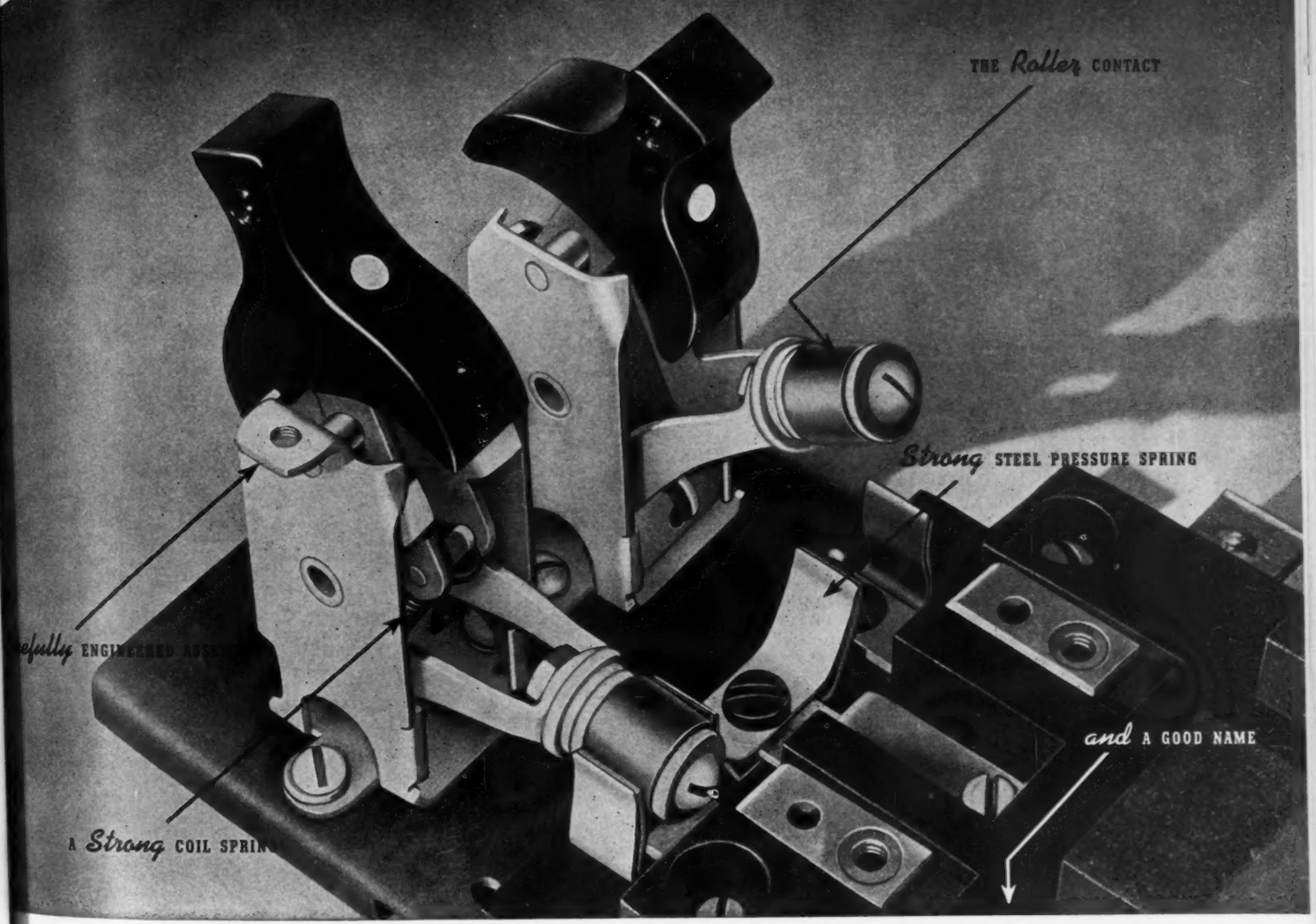
Similar purchasing by industrials included motors and controls, value $5,000, for the Bethlehem shipyard, $4,000 small motors and capacitors for a building insulation plant and $2,500 of elevator motors, with large stock orders of motors and control equipment for pumping plant manufacturers, now close to their seasonal peak of output. A variety of needs for street lighting, tunnel, bridge and aviation field cable has caused a heavy demand.

Phelps-Dodge is to spend $900,000 for two turbines, size 5,000 kva., and requisites for smelting and cooling equipment additions to its Douglas (Arig.) copper plant. San Francisco supervisors have authorized November ballot on $46,700,000 bond issue to cover a rapid transit and subway system under four main thoroughfares. Dealers report good sales of major appliances, especially in northern California, under stimulus of Pacific Gas & Electric Company's April refrigerator campaign, to be followed by a May range campaign.

. . . NO OTHER SWITCH LIKE THIS ONE WITH

8 Lbs. Pressure

AT CONTACT



Lighting panels can be built that meet every requirement of the code—and yet not include any of the refinements of construction that distinguish the products of our manufacture. For instance—our panels are equipped with 30 ampere single pole *roller contact* heavy duty toggle switches. Reinforcing the copper contact is a cadmium plated strong steel spring auxiliary contact which insures uniform pressure and produces 6 to 7 times greater pressure at points of contact than any other toggle switch tested. This extra pressure reduces the resistance at this point, resulting in a drop of only 8 millivolts across contact points, as compared with from 40 to 150 millivolts drop on other types of switches. Positive contact permitting full flow of current is insured. And that is what you want, isn't it? More than 200,000 of these switches are in use today—*and fewer than one a month are returned for repair or replacement.* We will be glad to send you our new engineering data catalog and specification manual. Just write.

Manufacturers of Safety Power Panels, Knife Switches, Pull Boxes, Cutout Boxes and Cabinets, and NAIB Panel Boards

THE CLEVELAND

Switchboard

COMPANY

2927 EAST 79TH STREET • CLEVELAND, OHIO

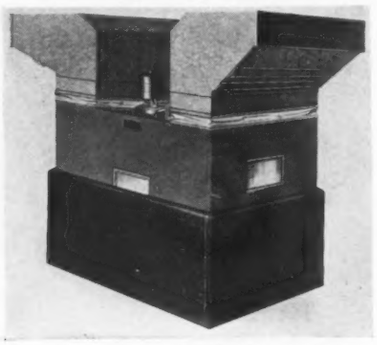
Established in 1900

Branch Offices at Chicago, Detroit, Indianapolis, Buffalo, Dayton, Pittsburgh, Philadelphia, Baltimore, Birmingham

New EQUIPMENT AVAILABLE

Air Conditioner

Air washing and accurate treatment and control of the conditioned air, formerly available in only the larger installations, is offered in a line of central plant units for residences and medium-sized commercial installations. Air is drawn through the Turbinator, which throws two sprays—a heavy spray which washes the air and a slow-moving mist spray which provides humidification. This washed air is then drawn through the Aqualute, a tapering spiral passage, where it is scrubbed and slowed down and the entrained moisture removed. This air is controlled as to purity, freshness, volume, velocity and humidity and passes through the discharge header into the ducts. Units can be installed to serve one cycle of conditioning and added to season by season until year around air conditioning is achieved.



Utica; four standard sizes; line ranges from 500 to 5,400 cu.ft. of air per minute, 7,500 to 480,000 B.t.u. or 1½ to 20 tons I.M.E. (cooling). **Utica Radiator Corp.**, Utica, N. Y.

•

Turbine Balancing Equipment

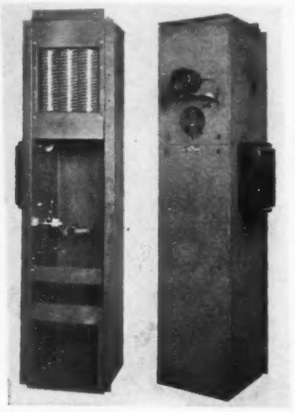
Portable balancing equipment is offered for power plant use in balancing large turbines and auxiliary machines such as fans, exhausters, pumps and motors. A synchronous motor unit is a new feature and is used in balancing 60-cycle machines running at 3,600, 1,800 or 1,200 r.p.m. In addition, the equipment includes a Model S-2 Vibrometer which measures vibration in two directions and also shows wave form. A photographic feature enables records of turbine vibration to be made periodically, it is said. A "single direction" Vibrometer, stroboscope lamp, breaker head and phase adjuster complete the equipment.

Davey portable balancing equipment. **Electrocon Corp.**, New York.

•

Recirculating Dryers

Operation of a new electric dryer is entirely electric and automatic; temperatures can range up to 250 deg. F. Any desired temperature is maintained without fluctuation by means of thermostatic control, it is claimed. Heating is accomplished by means of a calrod around which an aluminum grid is poured. The unit is assembled in a heavy steel duct, which may be bolted onto the drying oven or room. Fan is driven by means of an extension shaft, the motor being mounted on the outside of the duct. Thus high temperatures may be built up in the drying oven by recirculating the air through the heating unit.



"Electromode;" from 1 to 60 kw.; capacity, B.t.u. output, volume and velocity of air to suit requirements. **American Foundry Equipment Co.**, Mishawaka, Ind.

•

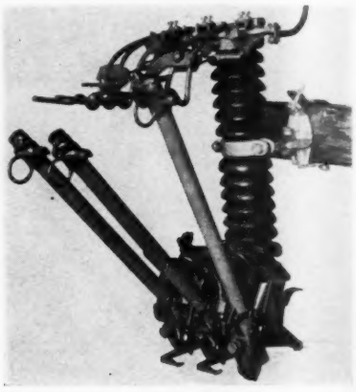
Welding Electrode

"Compensating Rod;" 18 in. long. **Electric Arc Cutting & Welding Co.**, Newark, N. J.

A new welding electrode is tapered; the small end is designed to give quick heat and easy starting and the gradual increase in diameter to increase the deposit of metal to keep the heat constant throughout the length of the rod. Thus, it is claimed, the disadvantage in using the straight rod, in either starting too cold or ending too hot, is overcome; waste ends are a minimum and higher current densities are possible.

Reclosing Fuse Switches

Linemen who can operate a single-shot, open-type drop-out cutout can operate these simple, low-cost, rural line, drop-out, reclosing fuse switches, says the manufacturer. As fuseholders are put in the switch in sequence, using a standard hot stick, No. 3 fuseholder finally engages its upper contact arms, with No. 1 and 2 fuseholders in reserve, as pictured. When a short circuit or overload causes the fuse link to part this fuseholder drops down, striking a tripping lever, which forces fuseholder 2 into its contact arms. Fuseholder 3 may then be re-fused and closed with the contact arms, with 1 and 2 in reserve as before. Stops prevent the lineman from refusing in the wrong order; thus, he could not re-fuse No. 3 fuseholder before No. 2, should both of these drop down and No. 1 be carrying the load. Standard flexible tail fuse links are used; reclosing time is 30 to 33 cycles.



Rural line dropout reclosing Matthews "Fuswitches"; in 5, 7½, 12½ and 15 kv., 100 amp. ratings; rupturing capacity, 2,000 amp.; with two or three fuseholders. **W. N. Matthews Corp.**, St. Louis.

•

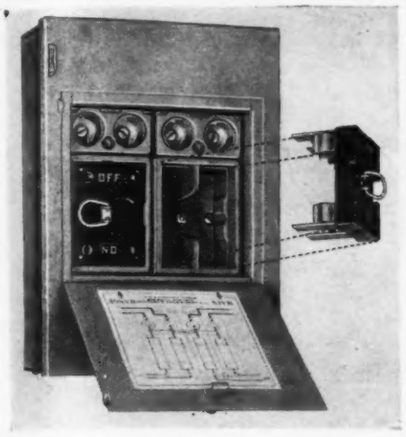
Electric Pliers

No. 10, "Thermo-Grip" electric pliers. **Ideal Commutator Dresser Co.**, Sycamore, Ill.

As a result of the success of a similar tool for small soldering work, and to meet the demands for a tool to handle larger work, this electrically heated soldering tool has been developed. Under continuous operation, it may be used for soldering lugs up to 1,050 amp., or for sweating pipe fittings up to 2½ in. in diameter; when used intermittently, it will handle pipe and fittings up to 4 in. in diameter, the manufacturer states. The line current from which it operates is reduced to a voltage said to be sufficiently low as to be harmless.

Service Entrance Equipment

Inclosed pull-out switches for entrance, meter and 1 ad-side distribution are designed for residences, apartments, stores and similar applications. With dead-front con-



Inclosed pull-out switches; pull-out unit only, 60 amp., 250 volts; pull-out, 31-60 amp., 125-250 volts, 3 pole, solid neutral branches, 0-30 amp., 125 volt plug fuses. **The Arrow-Hart & Hegeman Electric Co.**, Hartford, Conn.

struction. they are intended for the metering sequence of meter-switch-fuse. Combinations are available to provide for: main line and/or range branch circuit switches, with or without 2-8 plug fuse cutouts for branch lighting circuits.

•

Centrifugal Pumps

The manufacturer claims that this centrifugal pump supplies the most economical method, with the exception of gravity feed, of automatically handling waste water; it pumps directly from the catch basin. By equipping the pumps for automatic starting and stopping, it is claimed that the service of an attendant can frequently be dispensed with. Installation for underpass drainage is said to require only a catch basin or sump and an inexpensive housing.

"Freflo"; in capacities of 85 to 7,500 g.p.m. **Worthington Pump & Machinery Corp.**, Harrison, N. J.

•

Luminous Tube Transformers

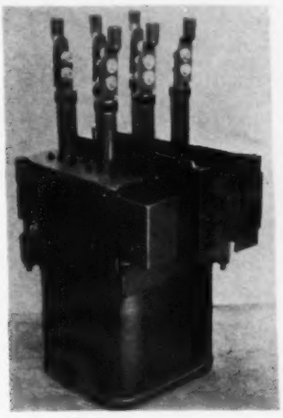
Types available for all standard secondary ratings, ranging from 2,000 volt, 18 ma. to 15,000 volt, 60 ma. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

Luminous tube transformers for both indoor and outdoor installation are available; a large assortment of types provides transformers to meet practically all the requirements in the sign industry. On units of 6,000 volts and above a mid-point, grounded design is used; this feature reduces electrical stresses on tubing and cable one-half, it is claimed. Primary coils are wound with a special paper-insulated, quadruple-enameled wire, secondary coils are wound with quadruple-enameled wire with glassine paper between layers; the cores are made of the same high-grade double-annealed iron used in the company's large power transformers.

•

Oil Circuit Breaker

New indoor oil circuit breakers with a rating of 75,000 kva. interrupting capacity are designed to fill the gap between the N.E.M.A. standard breakers of 50,000 and 100,000 kva. interrupting capacity. They



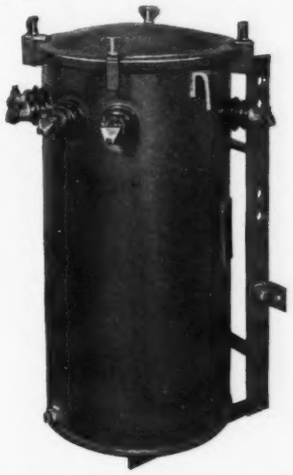
Class 75 TCR-1; ratings 600 amp., 15,000 volts; 1,200 amp., 7,500 volts; 2,000 amp., 5,000 volts. **Roller-Smith Co.**, New York.

employ the company's "Turblator" system of arc extinction. The 600- and 1,200-amp. breakers are rated at 30,000 amp. for five seconds and 45,000 amp. for one second; the 2,000-amp. breaker is rated at 40,000 amp. for five seconds and 50,000 amp. for one second. Two- and three-pole types are available for both automatic and non-automatic operation.

•

Distribution Transformers

Several new features are provided in this company's redesigned round tank, stud-bushing type, distribution transformers. Cov-



Type HEB; 15 kva., 2,400 volts. **Wagner Electric Corp.**, St. Louis.

ers are convex-shaped to provide a definite shed for water; four improved cover clamps and bolts secure the cover in place. Transformers 10 kva. and larger are provided with drain plug and oil-sampling device. The transformer pictured has co-ordinated bushings and insulation and is self-protecting; it is therefore inherently a surge-protected transformer, it is said.

Truck Controller

Announced as the "first basically new industrial truck controller in fifteen years,' this unit features a motor-type brush mounting which is rotary in action rather than

"Rotor-Brush Power Flow Control." **Automatic Transportation Co.**, Chicago.

stationary, as in conventional type controllers. Stator segments are commutator type, unit molded into a permanent, stationary, insulated base. Brushes are provided with a constant spring tension which, it is said, is self-compensating and needs no manual adjustment. This controller is now standard equipment on the company's line.

•

Vibrating Screen

Standard a.c. may be used in a new vibrating screen without auxiliary equipment such as motor-generator sets. An

"Utah" vibrating screen; particularly for screens having openings of ½ in. or less, either wet or dry; for 25, 50 or 60 cycles, 440 volts. **Allis-Chalmers Manufacturing Co.**, Milwaukee.

electromagnetic vibrating motor, applied mechanically to the screen, gets its power through a rectifier together with an auto-transformer and an amplitude-adjusting switch for regulating intensity of vibration. Dual magnets permit the magnetic forces to be applied equally in both directions.

•

Welding Electrode

"Wilson No. 520." **Wilson Welder & Metals Co.**, New York.

Striking and maintaining an arc is said to be accomplished without difficulty with a new electrode developed for use with small transformer type a.c. machines. It is claimed that operators find it exceptionally easy to handle.

Heat . . . Moisture . . . Oil . . . Grease . . . Acid Fumes . . . Age. You can almost hear these well-known deteriorators chuckling over the sabotage they are going to get in on the new wiring, as they check equipment modernization plans and gumshoe around skeletons of new construction for prospects.

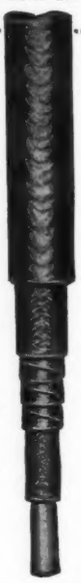
The best thing to do is to get the jump on them by using Rockbestos asbestos insulated wire in the spots that are subject to attack. Circuit installation comes high in labor and material and you've got to figure on the additional cost of replacement if you use ordinary wire. Another thing to consider is the economy of straight-line wiring. You don't have to detour for ovens, boilers, furnaces, or other hot spots with Rockbestos because it stands up under heat without drying out . . . and it's just as tough where oil, grease and acid fumes are encountered.

If you are building, relocating machinery or overhauling your wiring, use Rockbestos for a permanent job . . . *and save money.* On the basis of carrying capacity Rockbestos wire is frequently cheaper than ordinary wire. We manufacture many different constructions ranging from fine magnet wire to 2,500,000 C. M. cable. Would you like a catalog showing them? We'll be glad to send one, and samples too, if you'll drop a line to Rockbestos Products Corporation, 847 Nicoll St., New Haven, Conn.

Also refer to Electrical World Buyer's Reference Number of December 19, 1936, Part II.

Rockbestos A.V.C. Boiler Room Wire for general lighting and control circuits exposed to heat, etc.

1. Conductor
2. Felted Asbestos
3. Varnished Cambric
4. Felted Asbestos
5. Asbestos Braid (lead or armor)



ROCKBESTOS A.V.C.
the wire with permanent insulation

Coffin Awards Made by General Electric

Mrs. Sophia Baikusis, a widow who started with General Electric Company twelve years ago, has been honored with a Charles A. Coffin Foundation award, the highest honor the company bestows upon its employees. She has offered 89 suggestions for improved manufacturing methods and 54 have been accepted by the company as worth while. She received a cash award for the suggestions accepted and for being the company's best woman suggestor she has received the Coffin award.

Mrs. Baikusis is one of 33 employees who have just received such awards. The citations and cash awards are in recognition of outstanding accomplishments made by workers during last year. Miss Dorothy L. Short, Harold R. Acres, Joseph M. Lenehan and Alfred A. Thompson were among those receiving special recognition. The foundation was established in 1922 as a tribute to Charles A. Coffin, founder and first president of the company. Since that time 484 awards have been made.

•

Warns of Dangers in Attacks on Utilities

Warnings against cession of power control into the hands of the government were sounded recently by W. L. Burnie of Southern Canada Power Company. Addressing a Chamber of Commerce dinner at Drummondville, Mr. Burnie stated that more than $600,000,000 of outside capital has been attracted to the development of Quebec power companies.

Each year the power companies contribute to the people 10 per cent of their gross earnings that goes for taxation, Mr. Burnie said. "If the government takes over hydro-electric resources, the power companies' taxes must come from some other pocket."

After pointing out that "somewhere in the order of things" every one has a direct interest in power companies, Mr. Burnie sounded a final warning that "anything that is done detrimental to the interest of the power company, action taken that will cause injury or depress the value of the organization, is a direct attack on you and your prosperity."

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Wood Preservatives

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April 10, 1937

To Our Customers:

Two and a half years ago we introduced the Osmose Process for wood preservation in this country, firm in the belief that we had the answer to your problem—GROUNDLINE DECAY IN STANDING POLES. We have endeavored to convince you of the merits of the Osmose groundline treatment, based on satisfactory service records in Europe since 1930.

To date we have interested more than 70 public utilities in making test applications. Of these, 21 have already placed repeat orders and several have planned substantial programs for the year 1937.

That groundline decay in standing poles is a major problem, is clearly evidenced by the recent action of one committee of the American Wood Preserver's Association in requesting authority "to make studies concerning the ground-line treatment of poles in lines which were originally untreated or given superficial ground-line treatment and are now showing decay at the ground-line". The fact that the leading Wood Preserver's Association in the United States now recognizes the importance of this problem emphasizes the foresight of those who have already used the Osmose ground-line treatment.

We thank you for your cooperation that has helped us move forward.

Very truly yours,

OSMOSE CORPORATION OF AMERICA

The Osmose groundline treatment is the most efficient and economical method available today for treating standing poles. Detailed information of the process will be sent upon request to The Osmose Corporation of America, Buffalo, N. Y.

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Fostoria Localite Advantages Speed Equipment Installations Everywhere

The universal need for properly engineered equipment to stimulate localized high intensity lighting installations has been answered with the new modern Fostoria Localite. Now, effective application of light on the job — right intensity, glareless shading, ease of adjustment, freedom from vibration, lasting efficiency — is made practical in Localite engineered equipment. Enthusiastically approved and recommended by power company lighting engineers, installation of Localites by industrial concerns is rapidly increasing. Industry is benefiting by better workmanship and more profitable production.

A FEW RECENT FOSTORIA INSTALLATIONS

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- Ingersoll-Rand Co. Painted Post, N. Y.
- Leece-Neville Co. Cleveland, Ohio
- Delco Radio Corp. Kokomo, Ind.
- American Sewing Mach. Co. St. Louis, Mo.
- International Shoe Co. St. Louis, Mo.
- Westinghouse Elec. & Mfg. Co. Lima, Ohio
- Square D Company Detroit, Mich.
- Pratt & Whitney Co. Hartford, Conn.
- Dennison Mfg. Co. Framingham, Mass.

FLEXIBLE fostoria LOCALITE

THE FOSTORIA PRESSED STEEL CORPORATION
Fostoria, Ohio

Reclosers Sectionalize Distribution Lines

[*Continued from page 59*]

the new application under various circuit arrangements and different fault conditions.

In all the cases mentioned in the illustrations with faults on the line beyond the smaller capacity sectionalizing recloser the recloser at the head of the line, A, may open partially on certain currents near its trip point, but will immediately reclose, causing only a flicker in the lights in the circuit.

Verified by tests

To verify this performance tests were made. A 15-amp. and an 8-amp. recloser were connected in series and currents were passed through both, ranging from 33 to 250 amp., the full interrupting rating of the 8-amp. recloser. At currents less than 50 amp. the 8-amp. recloser operated without disturbing the closed position of the 15-amp. recloser. At 50 amp. and above there was a slight opening of the contacts of the 15-amp. recloser, but, because of the high speed with which the 8-amp. recloser interrupted the circuit, the 15-amp. device reclosed instantly, causing only a flicker to the lights in the part of the circuit which it protected.

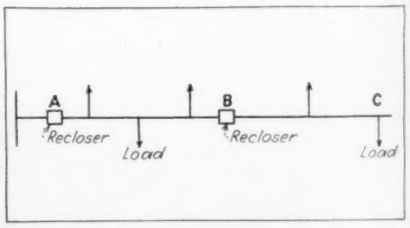

Fig. 4—Long feeder with loads at intervals

This represents a long distribution feeder with load taken off at intervals, where the short circuit current with a fault in section BC toward the end of the line is not of sufficient magnitude to trip the recloser placed at A. Since the load tapers off along the line, a smaller recloser (with lower trip point) can be used at B than at A, and the short-circuit current in section BC will be sufficiently high to trip the recloser at B. As in the previous case, non-persisting faults in sections AB and BC will be taken care of without interruption; a persisting fault in section AB will lock out recloser A and interrupt service over the entire line, while a persisting fault in section BC will lock out recloser B and interrupt service on section BC only. This latter protection would not be afforded by the larger capacity recloser at A alone because its trip point is too high for the short-circuit current involved.

The 8-amp. recloser went through its complete and normal operating cycle and locked out at any current

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THE SNOTEX SYSTEM

is for all *abnormal interior exposures* except where fungus may be expected. The highest attainable resistance to discoloration in the presence of humidity, fumes, gases, heat or unusual absence of daylight.

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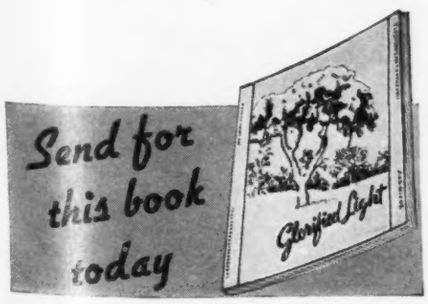

Pittsburgh Plate Glass Co., Paint Division, Dept. EW4, Pittsburgh, Pa.

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What About Mechanical Qualities In Electrical Insulating Materials?

Failure in some types of insulation is due primarily to mechanical or thermal shock rather than weakening of dielectric strength. To provide electrical insulation with strength to withstand severe mechanical stresses and thermal shocks, Continental-Diamond pioneered in the development of synthetic resinous, laminated insulating materials. The results of this development have produced insulation in a wide range of grades and with varying electrical and mechanical properties to meet practically all requirements.

Because we make all of these insulating materials we can recommend, without bias, the one that will most satisfactorily meet your particular requirements.

Continental-Diamond Insulating Materials include the following:

DILECTO (phenol fibre), a laminated phenolic insulating material.
DIAMOND VULCANIZED FIBRE, an extremely tough Vulcanized Fibre having high electrical insulating properties.
MICABOND, Mica in its most usable form.
VULCOID, a non-hygroscopic, economical insulating material.
DIAMOND INSULATION, a thin, tough, flexible Vulcanized Fibre with exceptionally high insulating properties which will stand extreme bending.
DILOPHANE, a new translucent color stock, specially adapted to fabrication of dials.

These various Continental-Diamond Insulating Products are manufactured in standard forms of sheets, rods and tubes and can be furnished in parts fabricated to your specifications.

CONTINENTAL-DIAMOND FIBRE COMPANY
Newark, Delaware

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value of the test without any lock-out of the 15-amp. recloser.

With an 8-amp. and a 25-amp. recloser in series the 8-amp. recloser operated normally without disturbing the contacts of the 25-amp. device until approximately 200 amp. was reached. From this point to 250 amp. (the full interrupting rating of the 8-amp. recloser) there was a very slight opening of the contacts on the 25-amp. recloser, which resulted in an instantaneous reclosing of the 25-amp. device. The 8-amp. recloser would, of course, lock out first and

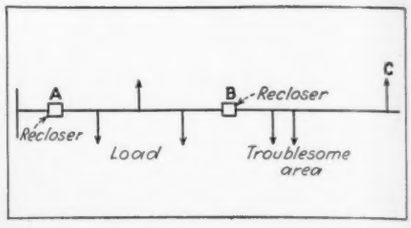


Fig. 5—Distribution contending with trees and lightning

This represents a distribution circuit with a particularly troublesome area just beyond B, due to bad tree conditions, lightning, etc. Providing the load current at point B permits it, a smaller ampere capacity recloser can be placed here immediately ahead of the troublesome area. Persisting faults in this bad section would then trip and lock out the recloser at B and interrupt service only on section BC, leaving the recloser at A closed and retaining section AB in service. As in the previous cases, a persisting fault in section AB will trip out the recloser at A and interrupt service over the entire line. Non-persisting faults in either section will not interrupt service.

leave the 25-amp. unit closed and on the line.

Tests were also made using three reclosers in series. In this case the lowest rated device operated normally and locked out with only very slight interruption in service by the higher rated reclosers.

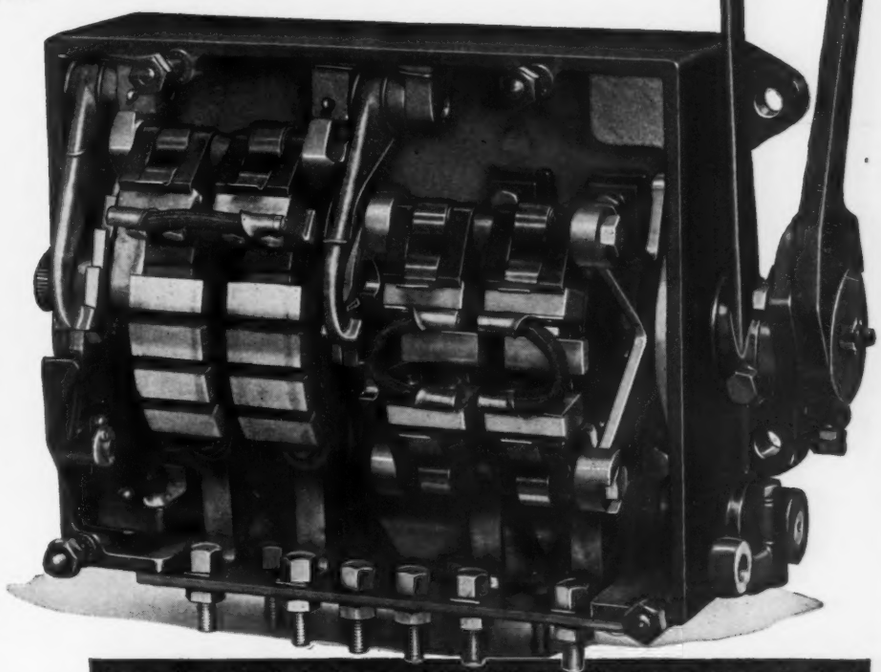
Function well in series

These tests indicate that it is entirely satisfactory to operate the reclosers in series for the purpose of sectionalizing the circuit, provided a lower rating is used for each sectionalizing device added. Fault currents passing through the sectionalizing recloser will operate it in a normal manner, and service between the sectionalizing recloser and the main recloser will not be affected for low fault currents and will be only briefly affected for higher fault currents. In all cases the lower rated device will lock out in case of a persisting fault, leaving the remainder of the circuit in service.

IMPORTANT NEWS!!!

THE FIRST BASICALLY NEW INDUSTRIAL TRUCK CONTROL IN 15 YEARS

ROTOR-BRUSH POWER FLOW CONTROL

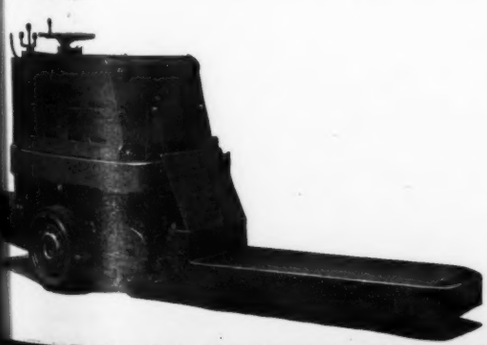


● ROTOR-BRUSH Power Flow Control was developed by "AUTOMATIC" engineers to meet the demand for RELIABLE VOLTAGE CONTROL — SMOOTH POWER PERFORMANCE — LONG MECHANICAL LIFE — LOW MAINTENANCE COST.

● ROTOR-BRUSH Power Flow Control is so radically different in DESIGN — CONSTRUCTION — PERFORMANCE that it outmodes by far the conventional controllers now used.

● ROTOR-BRUSH Power Flow Control has successfully met every test of actual heavy duty service, a total of 3,000,000 cycles, equivalent to 16 Hr. per day operation for 3 years.

● ROTOR-BRUSH Power Flow Control will now be the new standard motor control to be EXCLUSIVELY used on every new "AUTOMATIC" INDUSTRIAL TRUCK TRACTOR AND CRANE.



Some important features of ROTOR-BRUSH Power Flow Control

1. Motor Type Brush Mounting Rotary Action — Not Stationary — Constant Spring Tension—Self Compensating — No Manual Adjustment — Larger Contact Areas—Low Voltage Loss.
2. Commutator Type Stator-Segments Unit Moulded in Permanent Insulated Bases—No Loose Segments—No Separate Parts
3. Accessibility—Quick Interchange of Parts
4. Built In Dynamic Brake Control
5. Heavy Durable Jumpers on Brush Connectors
6. Foolproof Reversing Speed Safety Control
7. Serrated Shafts and Arms for Tight Gripping Connections
8. All Hand — All Foot Control or Combination of Both as Desired
9. Contactor Switch Control — Brushes Return to Neutral with No Voltage Load
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Highway WINCHES

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TIME, LABOR,
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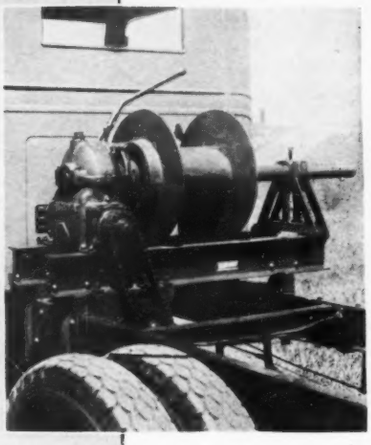

Designed for low-cost service, there is a Highway Winch for every need with types light enough to use on 1½- and 2-ton trucks. Highway Winches are lighter and more durable, easier to use and stay in service without costly maintenance requirements. They are built with the same precision that characterizes the best in automotive equipment. Exceptionally large size housings enclosing the winch worms and worm wheels permit the use of a generous supply of oil which keeps the working parts moderately cool under the most severe working conditions.

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EDGERTON WISCONSIN

Recent Rate Changes

ROCKY MOUNT, N. C., Board of Aldermen has made a 20 per cent cut in city electric service rates, affecting over 5,000 users and saving $60,000 a year. The cut became effective with March readings and applies to domestic and commercial rates. City Manager L. B. Aycock stated that the municipally owned plant expects a modest excess of income because of greater use of electricity.

BROCKTON EDISON COMPANY has filed a rate schedule with the state Department of Public Utilities, effective on approval May 1, which would cut domestic service charges $60,000 year for 30,000 customers.

M'COOK, NEB., City Council has approved reductions in the commercial light rates offered by the Nebraska Power & Light Company. The cut ranges from 5 to 11 per cent and establishes a 1-cent water heater rates for homes.

IOWA POWER & LIGHT COMPANY has cut light rates, effective March 1, reducing the first 30 kw.-hr. from 7½ to 6¾ cents and the next 30 from 6½ to 6¼ cents a kilowatt-hour. The excess over 60 kw.-hr. remains at 3 cents per kilowatt-hour. This applies to Montezuma. In Knoxville the rates were cut ¼ cents a kilowatt-hour for the first 60 and all over remain at 3 cents. A cut in rates for Indianola will save consumers $7,000 a year. Light rates for first 200 kw.-hr. were cut from 7 to 6 cents and all over the cut was ½ cent in the present rates. In Primgar a small discount is allowed for prompt payment of bills.

NEW YORK STATE ELECTRIC & GAS CORPORATION has filed revisions of electric rates for its Liberty district with the Public Service Commission. Savings are estimated at $78,833 annually. The commission permitted the lower rates to go into effect as of April 1. An area charge and an optional rate for residential users is eliminated.

ELLENVILLE ELECTRIC COMPANY, New York, has filed reduced electric rates with the commission to effect an estimated saving of more than $2,540 a year. The cut is effective April 1 and permitted by the commission.

NORTHERN STATES POWER COMPANY has filed reduced farm rates with the Wisconsin Public Service Commission. The new rate will remove the service charge and permit the use of 50 kw.-hr. for a base minimum of $4 a month, with a water heating schedule included at a 1 cent a kw.-hr. rate. The new rate permits the development of projects which include groups as small as 50 prospective customers.

INDIANAPOLIS LIGHT & POWER COMPANY representatives have agreed to terms of a light rate reduction order issued by the Public Service Commission. The temporary order is to remain in effect until made permanent by the commission. More than $500,000 in savings for consumers was promised in the rate structure, to take effect with the April billings.

LUMBERTON (N. C.) ELECTRIC LIGHT SYSTEM, municipally owned, has been ordered by the board to cut rates 20 per cent effective as of April 1. The rate will be lowered from 10 to 8 cents a kw.-hr.

VIRGINIA PUBLIC SERVICE COMPANY has filed and the commission approved a new schedule of electric rates applicable in Arlington, Alexandria and vicinity which will save consumers upward of $100,000. The new residential rates are 5 cents for the first 20 kw.-hr., 3.9 cents for the next 50, 2.8 cents for the next 130 and 2 cents

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WRITE FOR BULLETIN NO. 482W

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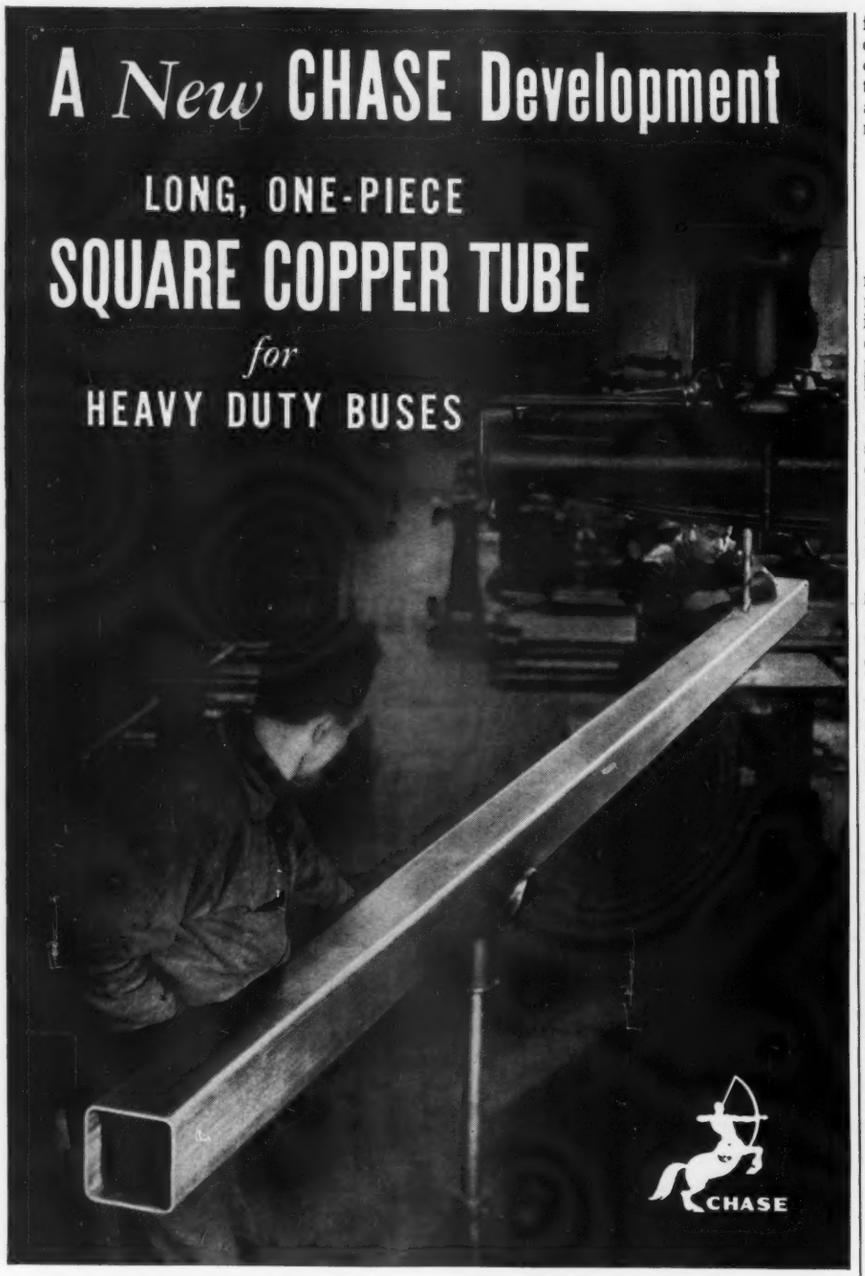

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for all over 200, with $1 as minimum charge. The new commercial rates are 5 cents for the first 20 kw.-hr., 3.9 cents for the next 480, 2.9 cents for the next 4,500 and 2.5 cents for all over 5,000, with $1 as minimum monthly charge.

•

Municipal Plants

GLASGOW, KY.—The Court of Appeals has refused to disturb a temporary injunction restraining an election on a proposed financing program holding that the city had not completed its plans for a proposed municipal power plant before submitting a $200,000 bond issue to the electorate. Justice James W. Stites pointed out that since no definite site had been selected "it seems the consumers, who must pay the piper, have an equal, if not greater, interest than the city in knowing how the money is to be expended and where the proposed plant is to be located when they vote on the proposition."

SANDUSKY, OHIO—Construction of a $1,400,000 municipal electric plant was halted by the Court of Appeals, which ruled that the city had not proceeded as its charter provides in issuing the bonds. Voters approved a bond issue in 1933 for the plant, but plans, specifications and estimates were not prepared and placed on file as required by city charter, the ruling stated. Suit against construction was filed by Ohio Public Service Company which now supplies power to the district.

CAMDEN, N. J.—The State Assembly miscellaneous business committee has reported favorably legislation permitting the city to issue bonds for financing a municipal power plant. Assemblyman Sheehan, Camden Democrat, sponsored the bill, which was opposed by representatives of Public Service Corporation. The measure has been a legislative issue for years and is the hub of the fight between Democrats and Republicans for control of the Camden city government.

HUSTISFORD, WIS.—The Public Service Commission has approved the purchase by the village of Hustisford of the Hustisford Light, Power & Manufacturing Company for $48,500. The village used a certificate of authority as a bargaining weapon in reaching an agreement with the privately owned utility.

FLANDREAU, S. D.—Voters at a special election decided to issue $165,000 of bonds to install a municipal power and light plant. It is to be a WPA project, with the government furnishing $76,000.

GLOUSTER, OHIO—The City Council has instructed the board of public affairs to proceed with preliminary steps to establish a municipal light plant. The city's contract with the Southern Ohio Electric Company expires in May, 1938.

SHEFFIELD, ALA.—Sale of $2,800 in 5 per cent revenue bonds for financing completion of the new municipal distribution system has been made to A. L. Hogan of New Orleans.

COEUR D'ALENE, IDAHO—Bids on a $300,000 bond issue for construction of a municipal power plant will be opened April 12. A Diesel plant is to be installed and distribution lines within the city built to compete with the Washington Water Power Company.

YORKTOWN, TEXAS—The state Supreme Court has upheld the validity of an election which authorized the issuing of bonds for construction of a city-owned power plant. The election was contested by Central Power & Light Company, which has been serving the city.

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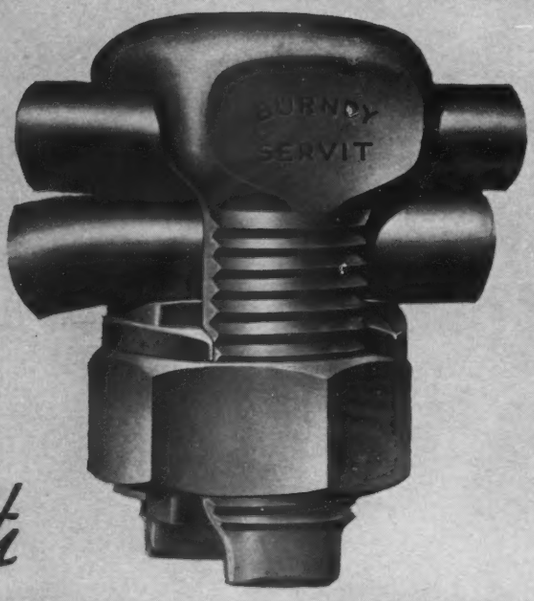

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Recent Legislation

ALABAMA—A 2 per cent retail sales tax has been levied by the Alabama legislature, but the sale of energy by utility companies has been exempted. The tax became effective March 1. Utilities, however, will be required to pay the tax on appliances sold by them.

ARKANSAS—Senate has passed a bill placing the authority to acquire utility plants by cities in the hands of the city councils through the vote of the people in a special election.

IDAHO—By a vote of 21 to 23 the Senate killed the Governor's bill to permit creation of power districts authorized to acquire plants, sell power, levy taxes and issue bonds. The Senate passed and sent to the House a bill prohibiting sale or transfer of power permits or sites without consent of the commissioner of reclamation and provides that only Idaho citizens or corporations a majority of whose stockholders are residents of Idaho can file on such sites.

IOWA—A bill has been introduced in the Senate and a companion measure in the lower house empowering city councils to subpoena records and papers of private utilities in rate hearings.

MINNESOTA—House has defeated the Stockwell bill for a constitutional amendment authorizing a $50,000,000 bond issue for state development of water power resources. Representative S. A. Stockwell of Minneapolis, who has offered his power bill at every session since 1923, has seen it defeated eight times in the House.

NEW YORK—Under the provisions of a bill introduced in the Assembly and referred to the public service committee the Public Service Law is amended by providing that no electric corporation shall make or impose on residential customers a minimum charge except as based on energy consumed by such customers, nor make additional charge for service or installation of apparatus or use thereof, nor base any rate or charge on outlets, rooms or area. A bill introduced in the Senate by Senator Burchill would add a paragraph to the Public Service Law, making it unlawful for public utility corporations to keep any accounts, records or memoranda other than those prescribed by commission or under authority of United States, unless no such forms have been prescribed.

Another bill introduced by Senator Burchill and referred to the public service committee amends the Public Service Law to charge municipality operating public utility with portion of compensation and expenses of commission for investigation of operation, service, practices, etc., of such municipality. Senator Burshill introduced another measure, amending Public Service Law, to provide that total amount which may be charged by commission for cost and expenses of proceedings, to public utility in any period of three successive calendar years shall not exceed 1½ per cent of gross operating revenue of such utility derived from intrastate operations in the last preceding year.

Under the provisions of a bill introduced in the Senate by Thomas F. Purchill, Democrat, of New York City, and referred to public service committee, the Transportation Corporations law is amended to prohibit discontinuance of gas or electricity for non-payment of bills instead of for any cause, until five days written notice has been served either personally or by mail.

TENNESSEE—A bill to permit municipalities to issue bonds for financing their own power distributing plants has been intro-

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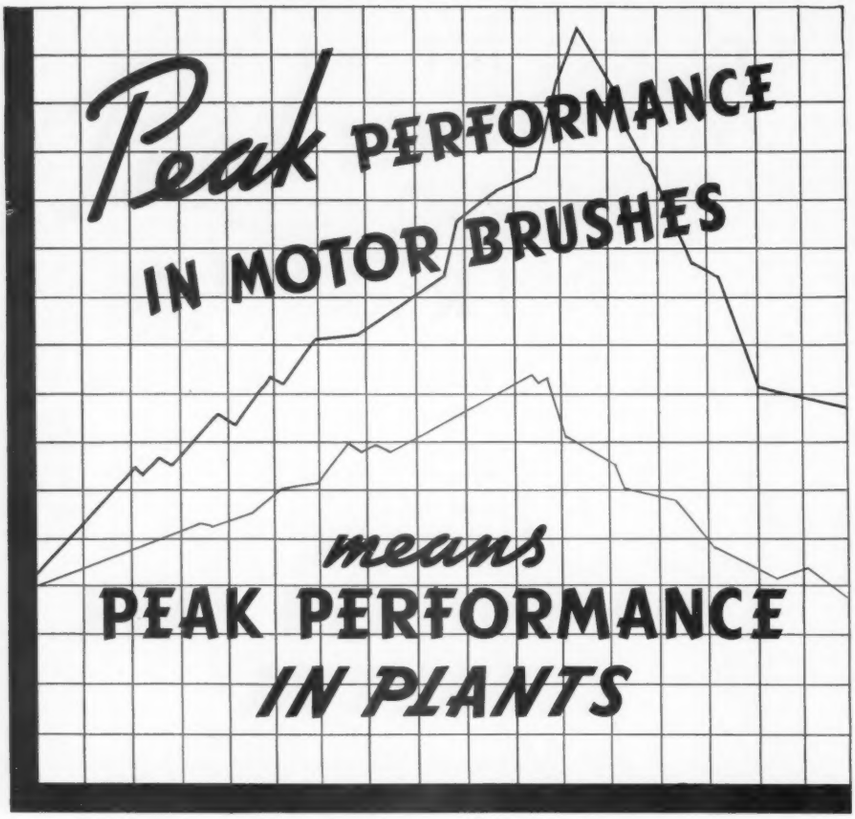

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duced in both houses. A non-profit and non-utility organization within the laws of the state would be formed for issuance and administration of the bonds and funds derived from them. These, the bill said, would be known as electric membership corporations and would be for promotion of "general welfare."

WISCONSIN—Governor LaFollette has signed the Rush bill, which prevents public utilities from extending electrical lines into territory in which a majority of residents have indicated preference for co-operative service. The new statute checks utility expansion within proposed co-operative territory for six months if a territory map is filed with the commission and for twelve months if the co-operative has obtained a federal grant.

Two utility bills have been passed by the Assembly and sent to the Senate for action. The first measure would assess the cost of appraisal investigations by the Public Service Commission in a municipal acquisition case against the public utility, while the second makes rate orders effective within 30 days after an order of investigation by the commission.

Public utilities would be barred from selling or renting gas, electric, heat or water appliances under the provisions of a bill introduced in the Assembly. The measure provides that utilities might display or demonstrate appliances for the purpose of increasing the sale of power, but the consumer would not be permitted to buy the appliances from the utility. The Sigman bill, introduced in the Assembly would regulate the financial transaction in the acquisition of a public utility by a municipality. After the State Public Service Commission has set the value of a utility to be acquired the commission might, under the terms of the bill, authorize issuance of certificates of indebtedness in exchange for bonds, mortgages and liens outstanding against the utility.

PENNSYLVANIA—The House has read for the second time the Holland bill making real estate of public utility companies subject to local taxation. An amendment which would exempt power plants, electric transmission lines and steam lines was voted down.

TEXAS—The Senate committee on state affairs killed all utility regulatory bills by bringing in adverse reports on them. No notice of a minority report was given. Regulating utilities was one of the principal recommendations to the Legislature by Gov. James V. Allred at the beginning of the current session.

The Tennyson House bill, as amended, has been passed. This bill, which goes to the Governor for signature, gives incorporated cities and towns the right to regulate rates charged for utilities using their streets and alleys, specifically water, gas, telephone, light, power and sewerage companies.

GEORGIA—The Senate has passed the House-approved rural electrification bill. The measure would permit setting up of rural electrification associations in co-operation with the federal government. The association would not be under jurisdiction of the Public Service Commission.

A repetition of former Governor Talmadge's act in ousting the Public Service Commission would be made impossible under a bill introduced by Senator David Atkinson of Savannah. The bill repeals the law under which the former Governor suspended the commission. The new measure provides that a council composed of the Governor, the chief justice of the Supreme Court and the chief judge of the Court of Appeals must hold a hearing and a ma-

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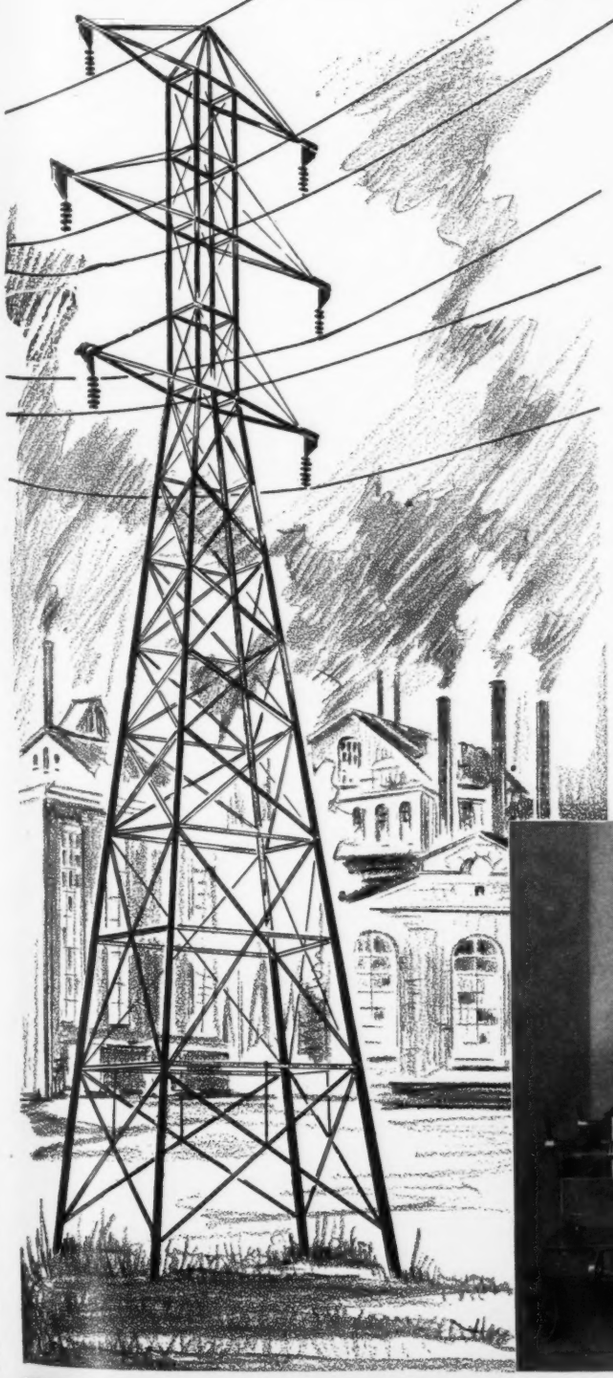

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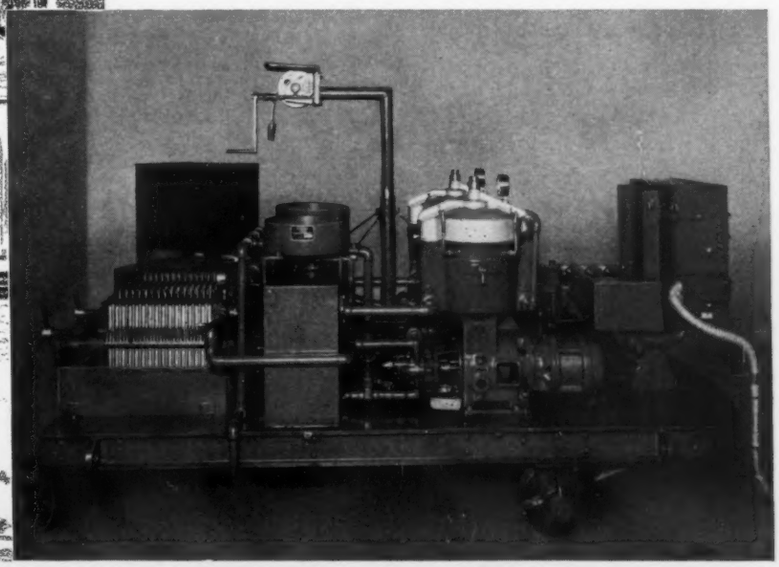

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jority must vote for removal before it becomes legal.

NEBRASKA—A bill introduced by two railway commissioners which would give the commission power to regulate intrastate rates and service of electric and natural gas utilities has been defeated by the commerce committee of the Legislature. It was opposed by the Nebraska League of Municipalities, which took the position that it would apply to municipally owned light and power plants.

•

Ohio Commission Reported Impotent

The Ohio Public Utilities Commission has lost the confidence of the public, it is "bogged down" by antiquated and cumbersome legal and rate-making procedure and has been subject to too much political control—these are the conclusions of the Ohio Government Survey in a report made recently to Col. C. O. Sherrill, chairman of the survey committee. The report was prepared by Howell Wright, formerly utilities director of Cleveland.

Mr. Wright recommended that the commission should be an administrative body, membership on which should constitute a profession and not a political job. Sufficient funds to permit the commission to do the job it is supposed to do should be provided by doubling, if necessary, the present assessments upon public utilities, he maintained. He further suggested that the public utilities code should be revised so that the commission could operate as an administrative, planning and fact-finding agency, make its own rules and regulations and be able to discard ordinary legal procedure in fixing rates.

In commenting on the recommendations, E. J. Hopple, commission chairman, declared: "As to the jurisdiction, operations and functions of the commission, Mr. Wright has not recommended anything that this commission has not been in accord with for ten years.

•

Airtemp Awarded Contract

Contracts to air condition four additional floors of the J. L. Hudson Company, one of the largest department stores in the country, located in Detroit, have been awarded to Airtempt Construction Corporation, the Michigan factory branch of Chrysler's Airtempt, Inc. Plans for the new year-round system involve 42 separate units.

PORTABLE GENERATING UNITS

36. **Bulletin PM 23720, 4 pp. D. W. Onan & Sons, Minneapolis, Minn.**—A gasoline-operated generating unit for operating electrical equipment, such as sound trucks, public address systems, sales demonstration trailers is presented, with dimensions and specifications given.

ELECTRICAL CONNECTORS

37. **Bulletin 4025, 4 pp. Burndy Engineering Co., Inc., New York, N. Y.**—Describes and illustrates a variety of the electrical connectors of this company, including the Servits.

WIRE & CABLE

38. **Catalog bulletin, 4 pp. Crescent Insulated Wire & Cable Co., Trenton, N. J.**—Tabular data on building wire and cable, conduit sizes for rubber-covered building wire are included in this new catalog section. Information is also given on various types of insulation and coverings.

BRONZE BEARINGS

39. **Bulletin 370, 32 pp. Johnson Bronze Co., New Castle, Pa.**—Lists over 100 general purpose bearing sizes in convenient progressive and numerical order. Electric motor bearings are included in this illustrated, comprehensive catalog.

NON-INDICATING CONTROLLERS

40. **Catalog 900C, 32 pp. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.**—Describes and illustrates the latest models of this company's line of non-indicating controllers for temperature, pressure and time. Also gives a discussion of the various types of controllers, their application and operation.

NOISE MEASUREMENT

41. **Bulletin 448-A, 4 pp. General Radio Co., Cambridge, Mass.**—A new sound level meter for making standardized noice measurements is presented and described in this folder.

HUMIDITY READING

42. **Form 650, 4 pp. H-B Instrument Co., Philadelphia, Pa.**—A new motor-operated aspirating psychrometer is included among the listed instruments for air conditioning engineers; temperature and humidity recorders are also shown.

DEODORIZING PLANT

43. **Bulletin M-2, 4 pp. Elliott Co., Jeanette, Pa.**—Treats of a fully automatic system, employing electric heat, for the deodorization of edible and industrial oils.

CHIMNEYS

44. **"A New High in Chimneys," folder. The Weber Chimney Co., Chicago, Ill.**—Describes a reinforced concrete chimney 600 feet high, erected in Corea by this company.

PORCELAIN ENAMEL SIGNS

45. **Blue Book, 8 pp. The Horace R. Whittier Co., Pequabuck, Conn.**—Lists some 3,000 porcelain enamel stock signs, available from this company.

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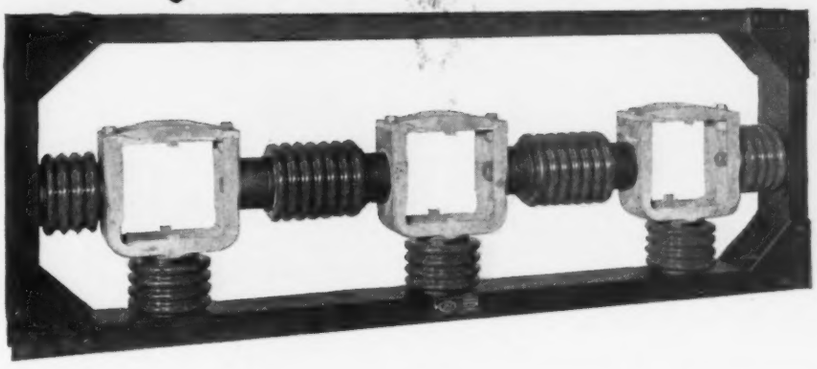

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Sales Opportunities

WATERLOO, IOWA—Iowa Public Service Company, Sioux City, Iowa, has approved plans for extensions and improvements in steam-electric generating plant on Lafayette Street, Waterloo, including construction of one and multi-story addition, for which contract has just been let to John G. Miller Construction Company, Black Hawk Building, Waterloo. Superstructure will begin soon. Installation will include new turbo-generator unit and accessories, high-pressure boilers and auxiliary equipment. Entire project will cost close to $1,000,000.

CHICAGO, ILL.—Acme Steel Company, 2840 South Archer Avenue, plans installation of motors and controls, transformers and accessories, electric hoists, regulators, conveyors and other equipment in new one and multi-story additions to plant in Riverdale district. Improvements will be made in present mill units and electrical facilities, including installation of new underground conduit system for power feeder lines to different buildings, replacing present overhead lines. Entire project will cost about $1,000,000 and will be placed under way soon. F. S. Hynes is company engineer in charge.

NEZ PERCE, IDAHO—Clearwater Valley Light & Power Association, Lewiston, Idaho, recently organized, has plans maturing for primary and secondary lines for rural electrification in Nez Perce County, totaling about 260 miles, with power substation and service facilities. A steam-electric generating plant will be built, with initial capacity of about 250 kw., for power supply. Fund of $325,000 has been secured through federal aid.

PITTSBURGH, PA.—United States Engineer Office, New Post Office Building, Pittsburgh, receives bids until April 14 for one 25-kw. hydro-electric power unit for installation at Lock No. 9, Allegheny River (Circular 343).

FINDLAY, OHIO—Central Ohio Light & Power Company has secured permission from Ohio State Utilities Commission to construct new steam-electric generating plant and to arrange financing in amount of $1,200,000, to provide funds for project, on which work will begin this spring. Installation will include turbo-generating units high-pressure boilers and auxiliary equipment, with substation and switching facilities, and transmission line for connection with high-tension system.

TONAWANDA, N. Y.—Chevrolet Motor Company, 3044 West Grand Boulevard, Detroit, Mich., a division of General Motors Corporation, Detroit, plans installation of motors and controls, electric hoists, transformers and accessories, conveyors and other equipment in new automobile engine, axle and gear manufacturing plant on tract of about 150 acres of land in Tonawanda Township, recently acquired. A power house will be built. Work is scheduled to begin soon. Cost over $3,500,000. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

MEMPHIS, TENN.—Light and Water Department will take bids soon for transformers and accessories, switchgear and other equipment for new municipal power substation "A," in South Gate district, to be connected with lines of TVA for municipal power supply. Award has just been made for grading of site and erection of station building to Walker & Michael, 1021 Haywood Street, Memphis, at price of $224,600, including certain mechanical equipment. Entire project is estimated to cost $6,872,000.

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Wagner types HEB-HE distribution transformers are manufactured in all commercial frequencies and voltages in sizes 1½ to 500 kva. For full information on Wagner distribution transformers write for Bulletin 180.

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● **THEY ARE WELL DESIGNED.** Due to precision of manufacture, careful selection of materials and parts, and intelligent engineering, Wagner transformers have all the features that are necessary for satisfactory performance, and yet they are unusually advanced in modern design.

● **THEY ARE THOROLY TESTED.** All parts and completed transformers are carefully tested to meet exacting specifications according to the latest transformer standards — an assurance that Wagner transformers are reliable, free from defects, and will give many years of continuous duty.

● **THEY WILL GIVE SATISFACTORY SERVICE.** Wagner transformers of today are the result of constant improvement in their mechanical design and efficiency, gained from the experiences of highly trained Wagner engineers and transformer users . . . working hand in hand . . . during 45 years of pioneering and developing. These years of experience have enabled Wagner engineers to determine the electrical designs that are best for satisfactory service.

● **THEY HAVE IMPROVED FEATURES.** Wagner transformers are representative of the latest developments in transformer design and manufacture . . . bushing and insulation coordination, steel tanks, protected and reenforced end-turns, non-aging silicon-steel cores, advanced core assemblies, extra-strong element structures.

● **THEY ARE CAREFULLY CONSTRUCTED.** In the coil winding, core construction, assembly and tank construction of every Wagner distribution transformer there is that extra skill and care that only experienced men under competent supervision, can impart into a product. Every step is double checked.

● **CONVENIENT SERVICE FACILITIES.** Because Wagner maintains 25 branch offices, warehouses, and service stations in all parts of the country, Wagner can give better and quicker service to your needs.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

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DUTY ENGINES

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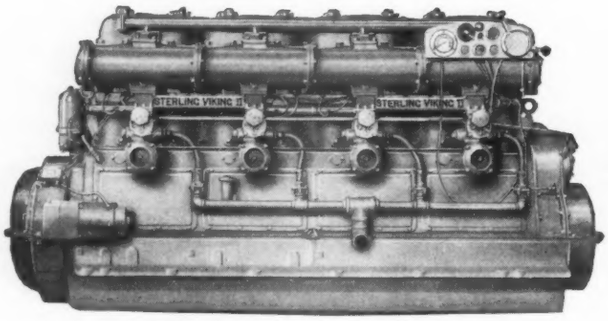
CONTINUOUS DUTY AT 750 TO 900 R.P.M.



Viking model 8 cylinder 8″ bore, 9″ stroke, 360 H.P., 900 R.P.M., on 100 BTU gas.

Scientific design provides a higher speed gas engine, with greater reliability because of a patented piston, lighter (dual) valves, counter weighted crankshaft, and better balance.

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Dept. C-2

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New York, N. Y.

BRADFORD, IOWA—Federated Co-operative Power Association, Iowa Falls, Iowa, Ralph Mason, president, is arranging early call for bids for equipment for steam-electric generating plant on site near Bradford, to be used for power supply for rural electric system. Fund of $225,000 has been arranged through Federal aid for power station.

LINDEN, N. J.—General Aniline Works, Inc., Grasselli, Linden, plans installation of motors and controls, regulators, conveyors and other equipment in new multi-story additions to local dye and chemical plant. Cost about $130,000.

CHICAGO, ILL.—Purchasing Officer, Department of Interior, 1749 West Pershing Road, Chicago, receives bids until April 13 for electrical equipment and supplies as required by the Indian Service during fiscal year 1938, including rubber-covered wire, armored cable, flexible cord, plugs, sockets, receptacles, plug type fuses, combination fuses adapters, switch boxes, switches and other equipment (Schedule 26).

BECKLEY, W. VA.—Appalachian Electric Power Company, Roanoke, Va., plans new service, equipment and operating building on Kanawha Turnpike, Beckley, with meter and line service divisions, equipment storage and distributing facilities, and other operating divisions. Cost about $160,000. Work is scheduled to begin soon.

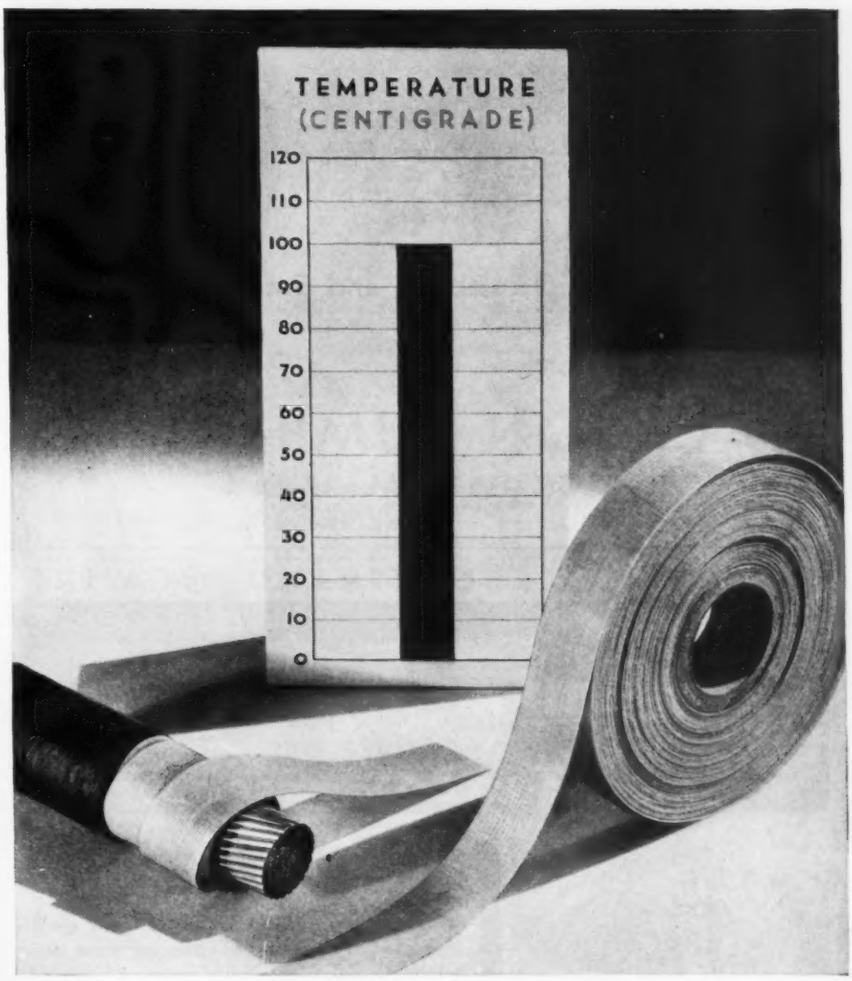
COLUMBIA, MO.—Boone County Co-operative Electric Association, Columbia, R. A. Dinwiddie, secretary, will take bids at early date for primary and secondary lines for rural electrification in parts of Boone County, totaling about 85 miles, with outdoor power substation and service facilities. Cost about $85,000. Approximately 45 miles of additional lines will be constructed at later date. Baumes-McDevitt Company, Railway Exchange Building, St. Louis, Mo., is consulting engineer.

MIDDLETOWN, OHIO—American Rolling Mill Company, Middletown, plans installation of motor-generator sets, heavy duty motors and controls, regulators, electric hoists, electric cranes, conveyors and other equipment for expansion and improvements in plants at Middletown, and Butler, Pa., and works of Sheffield Steel Corporation, Kansas City, Mo., a subsidiary interest. Program will include new mill units, open-hearth furnaces and other structures, and will require from 12 to 24 months for completion. Fund of $12,260,000 has been authorized for entire project.

LUCERNE, WASH. — Washington Water Power Company, Spokane, Wash., plans 110,000-volt transmission line from generating station at Chelan, Wash., to point near Lucerne, about 50 miles distant, for power supply for new milling plant of Howe Sound Company an its Chelan copper-mining properties at last noted place. Right-of-way for new line is being secured along west shore of Lake Chelan and surveys have been authorized. Power substation will be located at mining properties. Howe company will install motors and controls, regulators, conveyors and other equipment at new mill, which will be equipped to handle about 1,000 tons of ore per day.

HARTFORD, CONN.—Pratt & Whitney Company, Thomas Street, manufacturer of tools, flexible shafts and other mechanical equipment, a division of Niles-Bement-Pond Company, 111 Broadway, New York, N. Y., plans installation of motors and controls, electric hoists, regulators, conveyors and other equipment in new plant additions in recently acquired property in Charter Oak Park district. Cost close to $1,000,000. Albert Kahn, Inc., New Center Building, Detroit, Mich., is architect and engineer.

LOWER POWER FACTOR
at High Temperatures
with Bakelite Varnished Cambric



THE DEVELOPMENT of cambric coated with Bakelite Varnish has introduced remarkable improvements in the insulation of high voltage cables. For service at elevated operating temperatures, Bakelite Varnished cambric holds power losses to a new low limit. In repeated tests at 80°C., for example, this improved cambric, when properly conditioned, has shown a power factor of only 2.5% to 3.5% at 30 volts per mil and 60 cycles.

Further valuable advantages of Bakelite Varnished cambric are its exceptional ageing properties and resistance to oil. Random samples from numerous production runs have endured continuous baking for 2,600 to 3,000 hours at 100°C. without becoming brittle or tending to crack in bend-tests. Similar samples have shown consistent ability to withstand 15 minutes' immersion in transformer oil at 150°C. Electric light and power companies and cable manufacturers are invited to consult our engineers for complete information on this improved coated cambric made with Bakelite Varnish.

Bakelite Varnished cambric is made in straight-weave tapes for cable-making; and in bias tape for insulating splices, busbars and other hand-wrapped conductors.

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YELLOW PINE POLES

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Cut from our own timber stands

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Careful selection and grading

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STEEL STRAND MADE TO RIGID SPECIFICATIONS

Crapo Galvanized Steel Strand is a highly specialized product scientifically manufactured under direct laboratory supervision. Each grade and size is produced from start to finish to meet the exacting demands of the service for which it is intended. Each wire used in forming a particular size and grade is made from the same special steel, processed in the same way, and galvanized by the *Crapo* Process.

For further information consult the nearest distributor of *Crapo* Galvanized Products, or write direct!

INDIANA STEEL & WIRE CO.

Muncie, - - Indiana

BOOK REVIEWS

Troubles of Electrical Equipment

By H. E. Stafford. Published by McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 330 pages, illustrated. Price, $3.

Symptoms are the foundation on which this practitioner diagnoses the ills of electrical equipment of utilities and power users. Induction motors are treated first as to winding faults, operating difficulties and then the associated compensators. Symptoms are tabulated in parallel with the nature of the trouble, its cause and the appropriate remedy. The same is then done for synchronous motors, d.c. generators, transformers (including auto and instrument), voltage regulators (for generators), circuit breakers, relays and industrial motor control equipment. There are also chapters on lightning arrester troubles and on the customary insulation resistance tests (mostly industrial voltages).

There is a practical chapter on power factor and its correction, another on scheduling maintenance inspections and still another on the value and technique of making a load survey. Diagrams in general are up to date.

•

Electrical Year Book, 1937

Published by Emmott & Company, Ltd., 31 King Street, Manchester 3, England. 315 pages, illustrated. Price, 1/6 net.

This year's revisions of the Electrical Year Book (British) include the latest rules for cable and conduit capacity, new information on lighting circuits and switching and the most recent statistics related to electric traction. Also included in this handbook is commonly used technical information on the installation, application and operation of electrical machinery and apparatus used in industry and in electric railroads.

•

Dielectric Phenomena in High-Voltage Cables

By D. M. Robinson. Published by Instruments Publishing Company, 1117 Wolfendale Street, Pittsburgh, Pa. 330 pages, illustrated. Price, $5.

This is neither a treatise of the fabrication technique in making cables nor an exposition of the academic theory of cable deterioration and breakdown. On the contrary, it represents the effort of a Callender engineer to correlate the test and service phenomena with the properties of the dielectrics employed in high-voltage cables. In the chapter on technique of testing and examination, the voltage/time-to-breakdown test is shown to be deficient in indicating suitability to given duty, even though it does inform about performance in service. How failure may be arrested is also shown here and the wax study made significant. The "tracking" chapter attributes treeing to spark discharge and then develops in detail the progress of failure. The next chapter establishes thermal instability as a prolonged process which, however, delays deterioration until shortly before breakdown; also, the external thermal resistance (of the soil) generally outweighs the thermal resistance of the dielectric.

Why testing is largely done with d.c. is demonstrated and, in addition, the fact that the cable preserves its virgin state even

HOW GOOD ARE YOU AT SOLVING COMPOUND - HEATING PUZZLES ?

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IS A 7-LETTER WORD MEANING "Customer Satisfaction"

Whether it is a matter of melting wax, glue, pitch, or any other compound, the best method of heating is a very decided problem to many of your customers . . . and a real puzzle to some. Naturally, whatever help you give them in selecting the best equipment will go far toward promoting good-will towards the utility you represent.

Sta-Warm Heaters have established an enviable reputation for long and dependable service . . . they offer features of even heat distribution and accurate temperature control unapproached in other types of equipment. Hence, you can recommend Sta-Warm with perfect assurance that customer satisfaction will be prolonged for the many years that Sta-Warm serves him.

Learn more about Sta-Warm . . . as a good will ambassador, and as a potential load builder, too! There are innumerable plants you call on where Sta-Warm can replace non-electrified equipment . . . just another reason for promoting it enthusiastically. Write today for complete information.

Shown opposite are but three of the many types of Sta-Warm Heaters . . . there is a type and size exactly suited to every compound-heating requirement.

. . . and Sta-Warm provides THE CORRECT SOLUTION to every Compound-Heating Problem

WAX. Delivers a steady stream or single drop for application. Hand or foot operation. Precise thermostatic control to your specifications. Heated outlet, no freezing. Changeable needle valve seats to vary outlet flows—dual outlets, if desired. Booster starting switch.

SOLDER. Very efficient for soldering by immersion or dipping. Heats solder to just the right heat — no wastage — no fire hazard — on fumes. For lead, babbitt and such materials.

THERMOSTATIC COMPOUND TANK. A favorite of radio builders for impregnating. Capacity or shape can be modified to suit your needs. Heating is uniform, controlled accurately by thermostat of either fixed or selective type.

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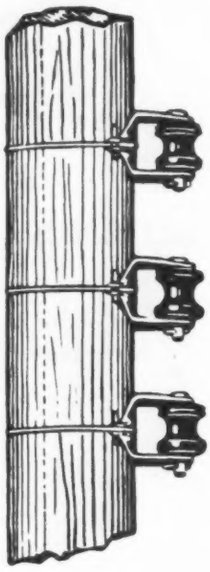
The UTILITY POLE FIXTURE
FOR LOWER LINE COSTS



- *Speedy Construction*
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- *Far-reaching Economy*

For a long time pole line hardware lagged, while stream-lined progress was making itself felt in every other field. The urgent need for modernization in rural and distribution lines is now met by the *Utility Pole Fixture*. Designed in keeping with today's trend toward minimum weight with increased durability, safety and efficiency.

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McGILL *Levolier* SWITCH No. 1020

10 Amp.
125 Volts

A—4-point break. B—Heavy contact spring to give good electrical contact. C—Separate contact springs and bridges for each filament to prevent overloading.

ACTUAL SIZE

Here's the ideal switch for controlling the new double-filament 3-light lamps. First pull lights small filament. Second pull turns it off, lights larger filament. Third pull causes both to burn. Fourth pull turns both off. Made in 3 stem lengths, with plain lever or cord controls. Can also be used as a link switch.

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after long time operation at high stress with severe heat cycles. "By periodic testing of a cable with excess d.c. voltage it has proved possible in practice to break down incipient faults which would have caused interruptions to service." Tracking is next shown to be an important avoidance in terminals and joints and the vulnerability of straight-type cables is attributed to low pressures existing at light loads. As to the formation and significance of voids, it is asserted that voids within the cable wall are not responsible for breakdown, but none are to be tolerated near the conductor. Loss is treated from both the breakdown and the economic angle in a comprehensive chapter. A final section correlates the design objectives with the phenomena which have been surveyed in the ten preceding chapters.

Cable users will find this a welcome interpretation of the state of the art of cable making as dictated by phenomena and principles otherwise scattered among research literatures.

•

The Valuation of Property

By James C. Bonbright. Published by McGraw-Hill Publishing Company, 330 West 42d Street, New York City. Two volumes. Price, $12.

Justice Brandeis has said that "value is a word of many meanings," and the author addresses himself in these two volumes to the task of philosophizing about as many of its variations as have to do with property, estates, enterprises and utilities. A sizable portion of the pages is devoted to utility values for rate, tax and condemnation purposes. On the matter of rate base he holds that the Supreme Court could hardly have done more to break down state regulation of utilities even if it had set out to do so with malice aforethought. He believes the damage is practically irreparable, that some variant of the prudent investment concept will supplant the fair value doctrine and, anyhow, yardsticks will continue to result in rates with little reference to a legal standard of reasonable return.

In general, the objective of the text is an understanding of the legal themes of valuation with minimum attention to criticism. The current tendency of practical folks to compromise and shop around among the alternative measures of a rate base is elaborated upon. Concepts of value are explored, along with depreciation, damages, insurance losses, estates, bankruptcy, corporate reorganization, dividend and dissenting stockholder cases and New Deal price-fixing agencies in respective chapters and each rates as a treatise in itself.

•

Welding and Cutting Year Book 1936-37

Edited by C. Helsby, C. W. Hamann & F. J. Samuely. Published by the Temsbank Publishing Company, Ltd., 12 Whitehall, London, S.W.I. 261 pages, illustrated. Price, 5 shillings.

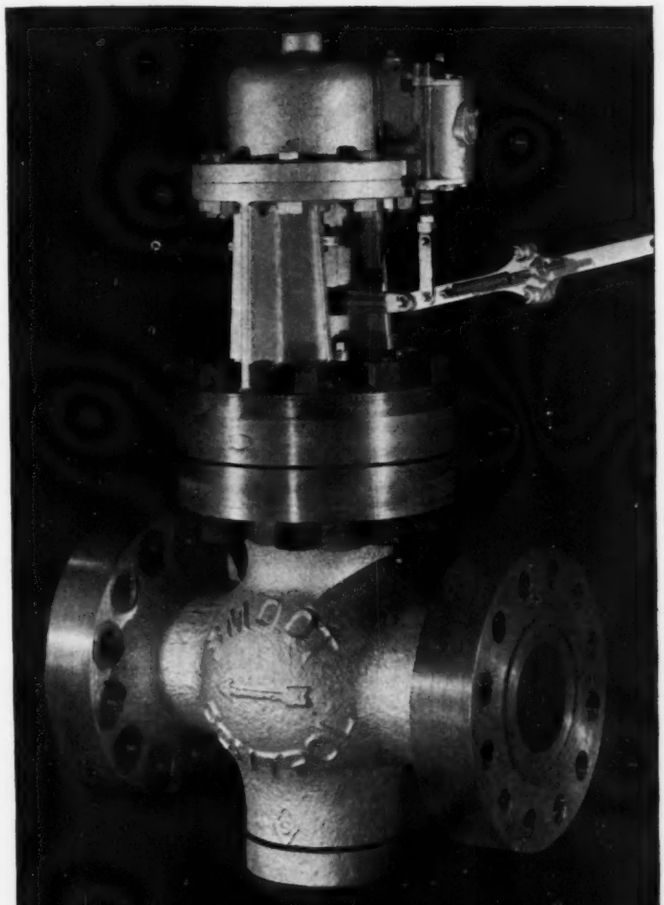
A summary of past practices and current developments in electric welding, atomic hydrogen welding, forge, thermite, carburetted water gas and electric resistance welding are in this annually published work. Equipment used and the latest approved welding techniques are discussed, as is the metallurgy of steel, mechanics of welds and other related subjects. The book is amply illustrated and carries many reference tables of value. The text should be of value to those desiring to become conversant with various types of welding and advances that are being made in the application of welding to modern structures.

SMOOT

FEED WATER CONTROL

THE STANDARD FOR MODERN BOILERS

★



SMOOT TURBINE TYPE VALVES

One of the three 3½-in., 1,500 lbs. Smoot Turbine Type Valves recently installed at the West End Station, Cincinnati Gas and Electric Co., to regulate the flow of feedwater to each of three 350,000 lbs. per hr. boilers operating at 1,200 lbs. steam pressure.

RECENT INSTALLATIONS

★

WEST END STATION. Boiler Water Level and Excess Pressure Pump Control for three 350,000 lbs. per hr., boilers operating at 1,200 lbs. steam Pressure.

MILLER'S FORD STATION. Boiler Water Level Control for two 375,000 lbs. per hr., boilers operating at 1,250 lbs. steam pressure.

NORTHEAST STATION. Boiler Water Level Control for one 350,000 lbs. per hr., boiler operating at 1,200 lbs. steam pressure.

OMAHA STEAM PLANT. Boiler Water Level Control for one 300,000 lbs. per hr., boiler operating at 1,200 lbs. steam pressure.

LOGAN STATION. Boiler Water Level and Pump Control for one 1,000,000 lbs. per hr., boiler operating at 1,325 lbs. steam pressure.

FISK STREET STATION. Boiler Water Level, Excess Pressure Pump Control for two 412,500 lbs. per hr., boilers operating at 1,275 lbs. steam pressure.

SPRINGDALE STATION. Boiler Water Level and Pump Control for three 500,000 lbs. per hr., boilers operating at 1,250 lbs. steam pressure.

WATERSIDE STATION. Boiler Water Level Control for four 500,000 lbs. per hr., boilers operating at 1,250 lbs. steam pressure.

STATE LINE STATION. Excess Pressure Pump Control for two 550,000 lbs. per hr., boilers operating at 1,200 lbs. steam pressure.

COMPLETE DATA MAILED UPON REQUEST

REPUBLIC FLOW METERS CO.

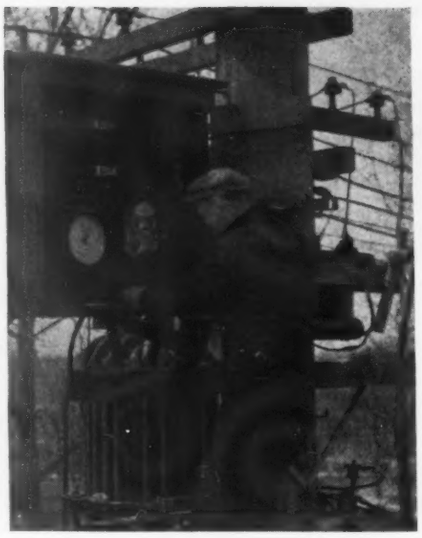
2228 DIVERSEY PARKWAY **CHICAGO, ILL.**

Commercial Load Factors Disclosed by Field Study

[*Continued from page* 58]

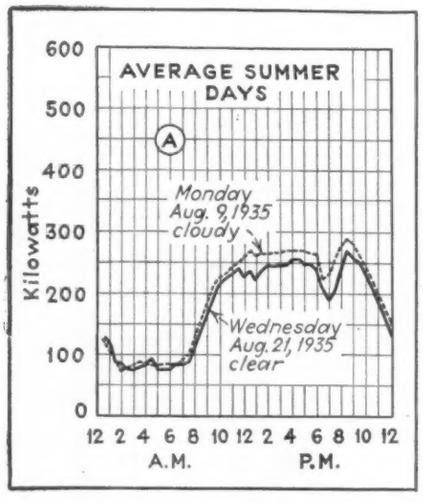
There are almost always a few residential customers connected to the secondaries. However, inasmuch as a similar test was being simultaneously conducted on the residence class, residential loads were eliminated from the totals, to give the load and diversity factors for the purely retail commercial business. However, the slight amount of residential load that was included made very little correction necessary.

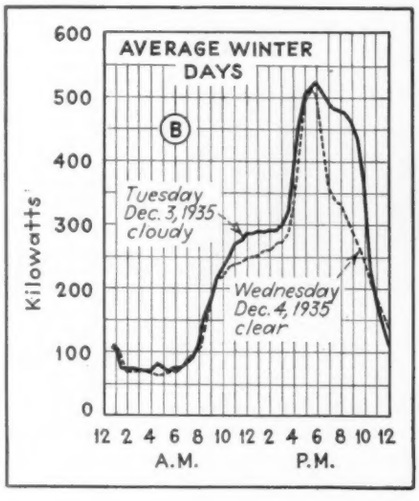
In all, the test includes some 275 meters, which represent the approximate number of retail stores, etc., in a city of perhaps 15,000 population. The results of the test were applied to the total of all retail commercial customers by the simple application of the monthly load factors of the test customers to the total kilowatt-hours sold to the retail commercial class for that month.

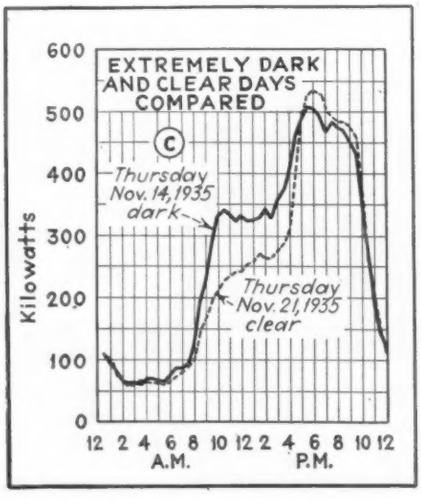


How the tests were made

The metering equipment and the type of weatherproof housing used in making this survey are pictured and are typical of all the locations tested. Equipment used includes a watt-hour meter, a curve drawing, recording wattmeter and the necessary accessories, such as current transformers, fuses, etc. Recording meter is equipped with a heating element, thermostatically controlled, to maintain an even temperature in cold weather.







Large seasonal variation in retail commercial load

The characteristics of the retail commercial load vary greatly between summer and winter. Chart "A" compares an average cloudy day in the summer with a clear day of 100 per cent sunshine. The all-day load is somewhat higher for the cloudy day.

Chart "B" compares an average cloudy day, Tuesday, December 3, when stores were open evenings with a clear day, Wednesday, December 4, when stores were not generally open evenings. A higher day load is shown for the cloudy day, and the greatly increased evening load for Tuesday as compared to Wednesday is shown.

Chart "C" compares an extremely dark day, Thursday, November 14, with the following Thursday, November 21, a clear day. The day load on the dark day is shown to be much the larger.

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ROME-CABLE
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Weatherproof Wires and Cables

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ELECTRICAL WORLD
McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK CITY. ONE DOLLAR PER COPY
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WHERE TO BUY IT
A complete compilation of information in handy time-saving form for buyers of electrical and allied products.
1. Classified Directory of Manufacturers
2. Product Exhibit Section
3. Alphabetical List of Trade Names
4. Useful Buying Data
BUYERS REFERENCE NUMBER FOR 1937

The Electrical Buyers Guide for 1937!

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Revised and Published Annually by

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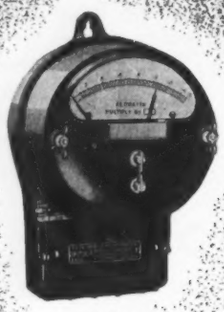
330 W. 42nd St., New York, N. Y.

LINCOLN Maximum Demand Meters



When the maintenance factor is considered in the total cost of demand meter installations, then Lincoln Meters are by far the most economical.

Thermo-Responsive Unit

TYPE WD
Watt Demand

Maintenance costs are low because only one unit moves - and that very slowly

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

STARS ON PARADE

QUALITY PORCELAINS

THAT MEET EVERY CONDITION IMPOSED BY HEAT, MOISTURE AND HARD USAGE. SEND BLUE-PRINTS TODAY FOR ESTIMATE.

The STAR PORCELAIN COMPANY
TRENTON NEW JERSEY

MAKERS OF ELECTRICAL PORCELAIN SINCE 1899.

★ LAVOLAIN
★ THERMOLAIN
★ VITROLAIN
★ NU-BLAC
★ COMMERCIAL WHITE
★ REGULAR PORCELAIN

STAR METER SEAL

Porcelain cap for all CS Meters. Cannot be removed without breaking.

SEND FOR SAMPLE

R.E.A. Makes Loans; New Contracts Set

Allotments totaling $1,194,000 for rural line construction, farmstead wiring and plumbing and rural electric generating facilities have been announced by Rural Electrification Administrator John M. Carmody. Allotments were made for projects in Alabama, Arkansas and Wisconsin. In addition, R.E.A. announced the approval of construction contracts for five R.E.A.-financed projects in Georgia, Iowa and Pennsylvania. Invitations to bid on construction have been issued on two R.E.A.-financed projects in Virginia.

Allotments

Baldwin County Electric Membership Corporation, Bay Minette, Ala., $200,000 to build about 211 miles; a co-operative now being organized in Mississippi County, Ark., $120,000 to build about 43 miles; Head-of-the-Lakes Co-operative Electric Association, Superior, Wis., $24,000 to finance farmstead wiring and plumbing for 141 members of the co-operative; Willard Electric Co-operative, Neillsville, Wis., $850,000 to build 674 miles.

Construction Contracts

Colquitt County Rural Electric Co-operative, Moultrie, Ga., $196,047, for 281 miles of lines; Monona County Rural Electric Co-operative, Onowa, Iowa, $65,655 for 93 miles; Sullivan County Rural Electric Co-operative, Hillsgrove, Pa., $94,353 for 118 miles; Tri-County Rural Electric Co-operative Association, Sylvania, Pa., $297,326 for 332 miles; Claverack Rural Electric Co-operative, Towanda, Pa., $201,716 for 251 miles.

Invitations to Bid

Issued by the Bull Run Power Company, Manassas, Va., for construction of a generating plant and approximately 60 miles of lines.

Southside Electric Co-operative, Blackstone, Va., for construction of approximately 120 miles.

Allotments totaling $382,000 for rural electric line construction in California, Georgia, Iowa, Minnesota and Montana were approved last month by Administrator Carmody. The allotments include:

Surprise Valley Electrification Co-operative, Cedarville, Cal., $140,000; Crisp Farmers Co-operative Association, Cordele, Ga. $25,000; Jones County Rural Electric Co-operative Association Preston, Iowa, $95,000; Fillmore County Co-operative Electric Association, Preston, Minn., $167,000, and Clarks Fork Power Association, Thompson Falls, Montana, $15,000.

Three loan contracts were executed between R.E.A. and project sponsors in Nebraska and Wisconsin:

Polk County Rural Public Power District, Stromsburg, Neb., may use up to $367,500 to build about 350 miles of lines serving 800 customers.

Burt County Rural Public Power Dis-

Standard
RURAL TRANSFORMERS

The same care and precision that are characteristic of all products bearing the Standard Trade-Mark are reflected in the dependable performance of Standard Rural Transformers. Write for Bulletin S-301.

THE STANDARD TRANSFORMER CO.
MANUFACTURERS
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BELL 1937 LBR. & POLE CO.
WESTERN RED & NORTHERN WHITE CEDAR POLES

Greater Strength
—Because of growth density
Greater Shock Resistance
—because of compact fibre structure
Longer Service Expectancy
—because of thinner sapwood in proportion to total cubical volume of naturally toxic heartwood

Expert butt treating to any desired specification. Try Bell's Fibre Spreading Pentrate Process with A. W. P. A. specification Oil—a thoroughly guaranteed treatment. Write for your copy of our "Cedar Pole Data Book"—it's yours for the asking.

BELL LUMBER & POLE CO.
MINNEAPOLIS, MINNESOTA

trict, Tokamah, Neb., may use up to $275,000 to build 250 miles of line to serve 600 customers.

Taylor County Electric Co-operative, Medford, Wis., may use up to $225,000 to build about 233 miles of lines to serve 900 customers.

•

Agree to Modify Ban on Texas Power Dams

Modifications in a standing injunction have been agreed upon which will permit the continuation of construction on a number of dams being built by the Lower Colorado River Authority of Texas and by the Brazos River Conservation District in the same state. The injunctions were secured at the instance of the Community Public Service Company, Dallas Power & Light Company, Gulf States Utilities Company, Houston Lighting & Power Company, Texas Electric Service Company, Texas Power & Light Company and Texas Utilities Company.

Under the terms of the modified injunction the government is free to: (1) Complete the Buchanan Dam (formerly Hamilton Dam) and purchase and install electrical generating equipment; (2) complete Inks Dam (also known as Arnold Dam) and purchase (but not install) generating equipment; (3) construct Marshall Ford Dam; (4) expend $200,000 for repairing Austin Dam; (5) proceed with construction on the Brazos River project, which does not at present contemplate power development.

The Lower Colorado development is financed by P.W.A.; the Brazos River projects by W.P.A.

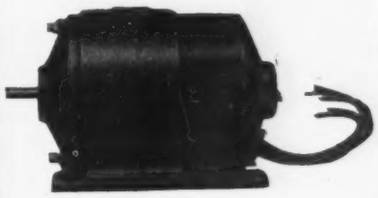
•

Output Rise Maintained

Official returns rendered to the British Electricity Commissioners show that 1,944,000,000 units of electricity were generated by authorized undertakers in Great Britain during February, compared with the revised figure of 1,824,000,000 units in February last year, representing an increase of 6.6 per cent. The number of working days in the month (excluding Sundays) was 24, against 25 last year.

During the first two months of 1937 the total amount of electricity generated by authorized undertakers was 4,120,000,000 units, compared with the revised figure of 3,794,000,000 units for the corresponding period of 1936, representing an increase of 8.6 per cent.

REMOTE INDICATION and CONTROL



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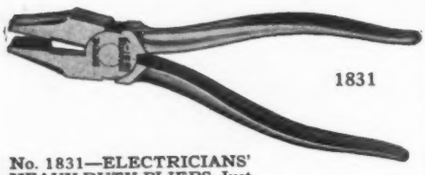

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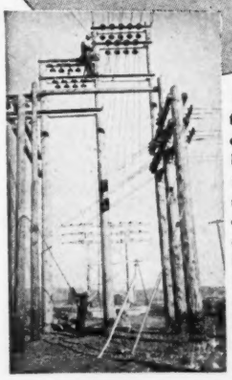

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